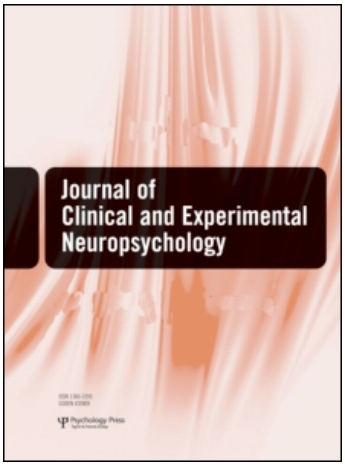

Journal of Clinical and Experimental Neuropsychology
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713657736

Academic procrastination in college students: The role of self-reported executive function

Laura A. Rabin[a]; Joshua Fogel[b]; Katherine E. Nutter-Upham[a]
[a] Department of Psychology, Brooklyn College and the Graduate Center of the City University of New York, Brooklyn, NY, USA [b] Department of Finance and Business Management, Brooklyn College of the City University of New York, Brooklyn, NY, USA

First published on: 25 November 2010

To cite this Article Rabin, Laura A. , Fogel, Joshua and Nutter-Upham, Katherine E.(2011) 'Academic procrastination in college students: The role of self-reported executive function', Journal of Clinical and Experimental Neuropsychology, 33: 3, 344 — 357, First published on: 25 November 2010 (iFirst)
To link to this Article: DOI: 10.1080/13803395.2010.518597
URL: http://dx.doi.org/10.1080/13803395.2010.518597

JOURNAL OF CLINICAL AND EXPERIMENTAL NEUROPSYCHOLOGY
2011, 33 (3), 344–357

Psychology Press
Taylor & Francis Group

Academic procrastination in college students: The role of self-reported executive function

Laura A. Rabin[1], Joshua Fogel[2], and Katherine E. Nutter-Upham[1]

[1]Department of Psychology, Brooklyn College and the Graduate Center of the City University of New York, Brooklyn, NY, USA
[2]Department of Finance and Business Management, Brooklyn College of the City University of New York, Brooklyn, NY, USA

Procrastination, or the intentional delay of due tasks, is a widespread phenomenon in college settings. Because procrastination can negatively impact learning, achievement, academic self-efficacy, and quality of life, research has sought to understand the factors that produce and maintain this troublesome behavior. Procrastination is increasingly viewed as involving failures in self-regulation and volition, processes commonly regarded as executive functions. The present study was the first to investigate subcomponents of self-reported executive functioning associated with academic procrastination in a demographically diverse sample of college students aged 30 years and below ($n = 212$). We included each of nine aspects of executive functioning in multiple regression models that also included various demographic and medical/psychiatric characteristics, estimated IQ, depression, anxiety, neuroticism, and conscientiousness. The executive function domains of initiation, plan/organize, inhibit, self–monitor, working memory, task monitor, and organization of materials were significant predictors of academic procrastination in addition to increased age and lower conscientiousness. Results enhance understanding of the neuropsychological correlates of procrastination and may lead to practical suggestions or interventions to reduce its harmful effects on students' academic performance and well-being.

Keywords: Academic procrastination; Executive functioning; Conscientiousness.

INTRODUCTION

Academic procrastination—the intentional delay in the beginning or completion of important and timely academic activities (Schouwenburg, 2004; Ziesat, Rosenthal, & White, 1978)—is a widespread phenomenon in college settings. Approximately 30% to 60% of undergraduate students report regular postponement of educational tasks including studying for exams, writing term papers, and reading weekly assignments, to the point at which optimal performance becomes highly unlikely (Ellis & Knaus, 1977; Janssen & Carton, 1999; Kachgal, Hansen, & Nutter, 2001; Onwuegbuzie, 2004; Pychyl, Lee, Thibodeau, & Blunt, 2000a; Pychyl, Morin, & Salmon, 2000b; Solomon & Rothblum, 1984). While occasional delays are acceptable and may even be advantageous, what distinguishes problematic or habitual procrastination from merely deciding to perform an activity at some later time is the accompanying internal subjective discomfort (Lay & Schouwenburg, 1993). This discomfort may manifest as anxiety, irritation, regret, despair, or self-blame (Burka & Yuen, 1983; Pychyl et al., 2000a; Rothblum, Solomon, & Murakami, 1986). There are also external consequences to chronic academic procrastination such as compromised performance and progress, decreased learning, lost opportunities, increased health risks, and strained relationships (Beswick, Rothblum, & Mann, 1988; Burka & Yuen; Burns, Dittman, Nguyen, & Mitchelson, 2000; Moon & Illingworth, 2005a; Rothblum et al., 1986; Tice & Baumeister, 1997).

Due to these significant negative aspects, researchers have studied procrastination and have proposed various cognitive, emotional, and personality variables as possible predictors. Frequently cited cognitive correlates include a tendency toward self-handicapping, low self-esteem, low academic self-efficacy, fear of failure, and

Address correspondence to Laura A. Rabin, Department of Psychology, Brooklyn College, 2900 Bedford Avenue,Brooklyn, NY, USA (E-mail: lrabin@brooklyn.cuny.edu).

http://www.psypress.com/jcen
DOI: 10.1080/13803395.2010.518597

distorted perceptions of available and required time to complete tasks (Ferrari, Parker, & Ware, 1992; Ferrari & Tice, 2000; Judge & Bono, 2001; Kachgal et al., 2001; Lay, 1988, 2004; Pychyl, Coplan, & Reid, 2002). With regard to emotional functioning, several studies have found that anxiety, depression, and worry are associated with procrastination (Antony, Purdon, Huta, & Swinson, 1998; Ferrari, Johnson, & McCown, 1995; Stoeber & Joormann, 2001; van Eerde, 2003), but the empirical evidence concerning the relationship between mood and procrastination is not definitive (Steel, 2007). In terms of personality features, research has consistently shown that lower conscientiousness and, to a lesser extent, higher neuroticism are related to trait procrastination (Johnson & Bloom, 1995; Lee, Kelly, & Edwards, 2006; Milgram & Tenne, 2000; Schouwenburg & Lay, 1995; van Eerde, 2003).

Various demographic and medical/psychiatric variables have also been examined in relation to procrastination. Research is inconclusive with regard to whether academic procrastination is related to students' gender (Steel, 2007; van Eerde, 2003). Although several studies have reported higher levels in males (Milgram, Marshevsky, & Sadeh, 1994; Ozer, Demir, & Ferrari, 2009; Senécal, Koestner, & Vallerand, 1995), many others have reported no such gender differences (Ferrari, 2001; Ferrari et al., 1992; Haycock, McCarthy, & Skay, 1998; Hess, Sherman, & Goodman, 2000; Kachgal et al., 2001). Research is similarly inconclusive regarding age, with some studies reporting negative correlations (Beswick et al., 1988; Prohaska, Morrill, Atiles, & Perez, 2000; van Eerde, 2003) and others reporting no meaningful correlations (Haycock et al., 1998; Howell, Watson, Powell, & Buro, 2006) between age and procrastination. Ethnicity (Clark & Hill, 1994; Kachgal et al., 2001; Prohaska et al., 2000) and level of intelligence (Ferrari, 1991a; van Eerde, 2003) do not seem to be related to procrastination, though there is little extant research on the relation between these variables. Students with drug and alcohol problems (Jamrozinski, Kuda, & Mangholz, 2009), learning disabilities (Klassen, Krawchuk, Lynch, & Rajani, 2008a), and attentional problems (Safren, 2006; Steel, 2007; Weiss & Murray, 2003) have also been reported to exhibit heightened levels of procrastination.

Procrastination is increasingly recognized as involving a failure in self-regulation such that procrastinators, relative to nonprocrastinators, may have a reduced ability to resist social temptations, pleasurable activities, and immediate rewards when the benefits of academic preparation are distant (Ariely & Wertenbroch, 2002; Chu & Choi, 2005; Dewitte & Schouwenburg, 2002; Ferrari, 2001; Schouwenburg & Groenewoud, 2001; Tan et al., 2008; Van Eerde, 2000; Wolters, 2003). These individuals also fail to make efficient use of internal and external cues to determine when to initiate, maintain, and terminate goal-directed actions (Senécal et al., 1995). Associated characteristics include reduced agency, disorganization, poor impulse and emotional control, poor planning and goal setting, reduced use of metacognitive skills to monitor and control learning behavior, distractibility, poor task persistence, time and task management deficiencies, and an intention–action gap (Dewitte & Lens, 2000; Dewitte & Schouwenburg, 2002; Ferrari & Emmons, 1995; Shanahan & Pychyl, 2007; Steel, 2007; Steel, Brothen, & Wambach, 2001; Tan et al., 2008; Wolters, 2003).

Research implicates frontal brain systems in self-regulatory and related processes, and this is generally referred to as executive functioning (Roth, Randolph, Koven, & Isquith, 2006; Stuss & Benson, 1986). Executive functions comprise various neurocognitive processes that enable novel problem solving, modification of behavior in response to new information, planning and generating strategies for complex actions, and the self-regulation of cognition, behavior, and emotion (Roth et al., 2006; Williams, Suchy, & Rau, 2009). Given the role of executive functioning in the initiation and completion of complex behaviors, it is surprising that little research examines the relationship between executive functioning and academic procrastination. Extant research is limited and/or indirect. For example, Schouwenburg (2004) found that procrastination was inversely correlated with adoption of a systematic and disciplined approach to one's work and with planning and managing of one's time, suggestive of poor organization. Wolters (2003) showed that procrastination correlated with students' self-efficacy and self-regulated learning strategies. Howell and Watson (2007) found that lower cognitive and metacognitive strategy usage and disorganization predicted procrastination in a sample of college students. Strub (1989) described the case of a 60-year-old man who developed chronic procrastination following a cerebral hemorrhage that resulted in frontal lobe syndrome. Thus, some evidence of associations between frontal system network dysfunction and procrastination has emerged, though it remains unclear which specific aspects of executive functioning are most implicated in delay behaviors.

To our knowledge, the only direct investigation of executive dysfunction as a source of procrastination is an unpublished doctoral thesis, which did not find a significant relationship between neuropsychological tests of executive functioning and severe academic procrastination (Stone, 1999). To address this gap in the literature and to capture more everyday aspects of executive functioning, the current study investigated the extent to which procrastination was predicted by self-reported executive functioning in a sample of college undergraduates. We carried out separate analyses for each of nine clinical subscales of a self-report measure of executive functioning, the Behavior Rating Inventory of Executive Function–Adult Version (BRIEF-A; Roth, Isquith, & Gioia, 2005). In our first model, we included each of the nine BRIEF-A subscales plus demographic and medical/psychiatric variables. In a second model, we included the first set of variables plus estimated IQ and relevant personality and mood variables. We hypothesized that BRIEF-A subscales tapping inhibitory control/impulsivity, self-monitoring, planning and organization skills, and task initiation would be significant predictors of academic procrastination. Conscientiousness, neuroticism, and mood symptoms were also hypothesized to be significant predictors of academic procrastination. We

did not generate specific hypotheses concerning the relation between procrastination and gender, age, ethnicity, alcohol or drug use, or various medical/psychiatric conditions, given the equivocal nature of findings or paucity of research on these variables.

METHOD

Participants and procedure

Data were collected from February 2007 through February 2009. Participants ($n = 212$) were drawn from various undergraduate psychology courses at a four-year public college that is part of a large, urban university system. Students were offered partial class credit or the chance to win a $50 gift certificate as compensation for participation. Students were informed that the study entailed completing a series of paper-and-pencil questionnaires that would take approximately 30–40 min on the general topic of academic motivation. Participation was voluntary and confidential, and informed consent was obtained according to an institutional review board (IRB)-approved protocol.

Our sample was obtained from a larger sample of 243 individuals. Data were collected in a psychology laboratory and in classrooms. Due to significant missing data, three questionnaires were excluded from statistical analysis. We also excluded individuals with invalid BRIEF-A protocols ($n = 2$) and those who were more than 30 years of age ($n = 26$) to allow for a similar young adult age profile, resulting in the final sample of 212 individuals.

Measures and scoring

Participants first completed a demographic questionnaire, which asked them to report their age (in years), sex (male or female), and race (African American, Asian, Caucasian, Hispanic/Latino, Native American, or "Other"). Participants also reported any medical or psychiatric conditions (scored dichotomously) including: diagnosis of learning disability, diagnosis of attention-deficit/hyperactivity disorder (ADHD), current use of alcohol, diagnosis of psychiatric/neurological illness(es), diagnosis of chronic/major medical problem(s), and current illicit drug use. Participants then completed the following study measures in the order in which they are listed: (a) Lay General Procrastination (GP) Scale, Student Version (Lay, 1986); (b) Beck Depression Inventory–II (BDI–II, Beck, Steer, & Brown, 1996); (c) Beck Anxiety Inventory (BAI; Beck & Steer, 1993), Shipley Institute of Living Scale (Shipley, 1991), BRIEF-A, and NEO Five Factor Inventory (NEO-FFI; Costa & McRae, 1992).

The Lay GP is a 20-item measure of trait procrastination that examines behavioral tendencies to delay the start or completion of everyday tasks. Participants rate various statements on a 5-point Likert scale (1 = extremely uncharacteristic; 5 = extremely characteristic). Sample items include: "I often find myself performing tasks that I had intended to do days before" and "I usually start an assignment shortly after it is assigned." Ten items are reverse-keyed, and scores range from 20 to 100 with a higher total score indicating greater procrastination. The Lay GP is considered unidimensional, and it has good validity and reliability in a variety of contexts (Diaz-Morales, Ferrari, Diaz, & Argumedo, 2006; Ferrari, 1989; 1991b; Lay, 1988; Lay & Burns, 1991).

The BRIEF-A is a self-report measure of executive functions or self-regulation in the everyday environment, which includes nine nonoverlapping theoretically and empirically derived clinical scales. Participants rate the frequency of 75 problematic behaviors over the past month on a 3-point scale (1 = never; 2 = sometimes; 3 = often), and higher scores indicate greater degrees of executive dysfunction. Mean raw scores and standard T scores can be calculated for each of the clinical scales, and there are also three validity scales (Negativity, Inconsistency, and Infrequency); as mentioned above, we excluded participants with elevated scores on one or more of the validity scales (defined as a T score of 65 or greater). The BRIEF-A has demonstrated reliability, validity, and clinical utility as an ecologically sensitive measure of executive functioning in healthy individuals and also those presenting with a range of psychiatric and neurological conditions (Roth et al., 2005).

The BRIEF-A Inhibit scale contains 8 items that measure behavioral regulation or the ability to not act on an impulse (e.g., "I have problems waiting my turn"). The Self-Monitor scale contains 6 items that measure the extent to which a person keeps track of his/her behavior and its impact on others (e.g., "When people seem upset with me, I don't understand why"; "I say things without thinking"). The Plan/Organize scale contains 10 items that assess the ability to manage current and future-oriented task demands within their situational contexts (e.g., "I don't plan ahead for tasks"; "I have trouble organizing work"), The Shift scale contains 6 items that measure the ability to shift behaviorally or cognitively from one situation, activity, or aspect of a problem to another, as the circumstances demand (e.g., "I have trouble thinking of a different way to solve a problem when stuck"). The Initiate scale contains 8 items related to the ability to begin a task and to independently generate ideas, responses, or problem-solving strategies (e.g., "I start things at the last minute such as assignments, chores, tasks"). The Task Monitor scale contains 6 items that measure the extent to which an individual keeps track of his/her problem-solving success or failure (e.g., "I misjudge how difficult or easy tasks will be"). The Emotional Control scale contains 10 items related to a person's ability to modulate emotional responses (e.g., "I overreact to small problems"; "I get emotionally upset easily"). The Working Memory scale contains 10 items that tap the capacity to hold information in mind for the purpose of generating a response or completing a task (e.g., "I have trouble with jobs or tasks that have more

than one step"). The Organization of Materials scale has 8 items that assess orderliness in one's everyday environment and the ability to keep track of everyday objects, including homework (e.g., "I have trouble finding things in my room, closet, or desk").

The NEO-FFI is a used to measure the "Big Five" domains of adult personality (openness, conscientiousness, extraversion, agreeableness, and neuroticism). The 60 items include questions about typical behaviors or reactions. Participants rate themselves using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). The current study analyzed participants' scores on the neuroticism and conscientiousness subscales because of their known association with procrastination. Neuroticism refers to a person's stress reactivity or emotional responsiveness to challenge and proclivity for negative mood states such as anxiety or worry. Conscientiousness denotes the extent to which a person is task oriented, achievement striving, deliberate, dependable, careful, and organized, and possesses self-control. We utilized NEO-FFI raw scores (range 0 to 48 per scale), which can be used to derive percentiles from a college-age normative data sample. Previous research has demonstrated the reliability and validity of this measure (Caruso, 2000; Costa & McCrae, 1992; Holden, 1992) and its association with a variety of psychological and health variables (John & Srivastava, 1999; Matthews, Deary, & Whiteman, 2003).

The Shipley Institute of Living Scale (Shipley) is a test of general intellectual functioning for adults and adolescents, which contains two subscales—Vocabulary and Abstraction. The 40-item Vocabulary section requires individuals to select the word closest in meaning to a target word from among four alternatives. The 20-item Abstraction section requires individuals to complete a series of numbers, letters, or words with the next item that should follow in the sequence. A total score is calculated, which is used to derive a Full Scale IQ estimate. The Shipley has shown strong psychometric properties in both healthy and clinical populations (Nixon, Parsons, Schaeffer, & Hale, 1995; Phay, 1990; Smith & McCrady, 1991; Zachary, Crumpton, & Spiegel, 1985).

The Beck Depression Inventory–II (BDI–II; Beck et al., 1996) and Beck Anxiety Inventory (BAI; Beck & Steer, 1993) are among the most widely used self-administered measures of emotional functioning, and there is strong support for their reliability and validity with young adults (Arnou, Meagher, Norris, & Branson, 2001; Carmody, 2005; Osman, Kopper, Barrios, Osman, & Wade, 1997). The BDI–II consists of 21 items that assess the intensity of depression experienced in the past two weeks. Each item contains a list of four statements arranged in increasing severity about a particular symptom; total scores range from 0 to 63, with higher scores indicating stronger severity of depressive symptoms. The BAI evaluates both physiological and cognitive symptoms of anxiety and consists of 21 self-administered items, each describing a common symptom. The BAI is rated on a scale of 0 to 3 (0 = not at all bothered; 3 = I could barely stand it), indicating the degree to which the individual has been bothered by each symptom during the past week. The BAI has been found to reliably discriminate anxiety from depression while displaying convergent validity (Beck & Steer). Item scores are summed to obtain a total score that can range from 0 to 63, with higher scores indicating higher levels of anxiety.

Statistical analyses

Descriptive statistics were calculated for all variables. For the multivariate analyses, the continuous variable of academic procrastination was used as the outcome variable. Linear regression analysis was used to determine the variables associated with the outcome of academic procrastination. Two models were conducted for each of the nine BRIEF-A executive functioning clinical scales. Model 1 consisted of the independent variables of demographic variables (i.e., age, sex, race/ethnicity dichotomized as Caucasian versus minority), presence of a number of medical and psychiatric diseases or conditions (i.e., diagnosis of learning disability, diagnosis of ADHD, current use of alcohol, diagnosis of psychiatric/neurological illness(es), diagnosis of chronic/major medical problem(s), and current illicit drug use), and the particular executive functioning category. Model 2 consisted of the independent variables of those in Model 1 plus estimated IQ, depressive symptoms, anxiety symptoms, NEO-Neuroticism, and NEO-Conscientiousness. SPSS Version 17 was used for all analyses. Analyses in Model 2 had 24 fewer participants because of missing data on the BDI–II.

RESULTS

Table 1 shows the descriptive statistics. The sample had an average age of more than 21 years, and more than three quarters were women. In terms of ethnic/racial composition, 60% identified as Caucasian, 14% Asian, 13% African American, 5% Hispanic, and 8% as "Other." For the purposes of the statistical analyses, race was treated as a dichotomous variable (i.e., Caucasian/minority) in order to prevent possible statistical overadjustment. Almost half the sample reported drinking alcohol, with an average of 2.7 drinks per week (SD = 2.9) among those who drank. The other five conditions/diseases all were less than 5%. Though not shown in Table 1, the psychiatric/neurological illnesses included borderline personality disorder, obsessive compulsive disorder, generalized anxiety disorder, various eating disorders, depression, epilepsy, and traumatic brain injury. The reported medical conditions included asthma, hyperthyroidism, diabetes, cardiovascular disease, and polycystic ovary disease. Average procrastination scores were within the neutral range, while scores ranged from minimal to severe. Average BRIEF-A scores were within the normal range, while approximately 12.5% of scores were within the clinically elevated range (defined as a T score of 65 or greater). Average NEO Neuroticism and

TABLE 1
Descriptive statistics for the sample of 212 undergraduate students

Variables	*Mean (SD)*	*% (n)*
Age (years)	21.7 (2.65)	
Gender		
Male		23.1 (49)
Female		76.9 (163)
Race		
Caucasian		59.9 (127)
Minority		40.1 (85)
Learning disability		
No		96.7 (205)
Yes		3.3 (7)
ADHD		
No		98.1 (208)
Yes		1.9 (4)
Alcohol drinking		
No		50.5 (107)
Yes		49.5 (105)
Psychiatric/neurological illness		
No		95.8 (203)
Yes		4.2 (9)
Major medical problems		
No		95.3 (202)
Yes		4.7 (10)
Drug use		
No		95.3 (202)
Yes		4.7 (10)
Procrastination	60.6 (9.09)	
BRIEF-A		
Inhibit	12.6 (2.87)	
Shift	9.8 (2.37)	
Emotional Control	17.3 (4.47)	
Self-Monitor	9.2 (2.35)	
Initiate	12.9 (2.91)	
Working Memory	12.3 (2.95)	
Plan/Organize	15.5 (3.47)	
Task Monitor	10.2 (2.06)	
Organization of Materials	12.8 (3.53)	
BAI	10.8 (9.65)	
BDI–II ($n = 192$)	10.1 (8.44)	
Shipley IQ	112.6 (7.50)	
NEO-N ($n = 210$)	28.2 (8.00)	
NEO-C ($n = 210$)	35.4 (7.57)	

Note. *SD* = standard deviation, ADHD = attention-deficit/hyperactivity disorder, BRIEF-A = Behavior Rating Inventory of Executive Function–Adult Version, BAI = Beck Anxiety Inventory, BDI–II = Beck Depression Inventory–Version 2, IQ = intelligence quotient, NEO-N = NEO Neuroticism, NEO-C = NEO Conscientiousness.

Conscientiousness scores were within the average to high range, with scores that ranged from low to high. Average anxiety and depressive symptoms were within the minimal to mild range, with scores that ranged from minimal to severe.

Table 2 shows the linear regression analyses for the executive functioning categories of Inhibit, Shift, and Emotional Control. For Inhibit, Model 1 shows significance for both increasing age and Inhibit with increasing procrastination. Model 2 shows similar significant results for age and Inhibit. Also, NEO-Conscientiousness approached significance ($p = .054$) with decreasing scores associated with increasing procrastination. For Shift, Model 1 shows significance for both increasing age and Shift with increasing procrastination, and increasing BDI–II had a p-value of .098 for association with increasing procrastination. Model 2 shows significance for increasing age and decreasing NEO-Conscientiousness scores associated with increasing procrastination while Shift was no longer significantly associated with procrastination. For Emotional Control, Model 1 shows significance for both increasing age and Emotional Control with increasing procrastination. Model 2 shows significance for increasing age and decreasing NEO-Conscientiousness scores associated with increasing procrastination while Emotional Control was no longer significantly associated with procrastination.

Table 3 shows the linear regression analyses for the executive functioning categories of Self-Monitor, Initiate, and Working Memory. For Self-Monitor, Model 1 shows significance for both increasing age and Self-Monitor with increasing procrastination. Model 2 shows similar significant results for age and Self-Monitor. Also, decreasing NEO-Conscientiousness scores were significantly associated with increasing procrastination, and increasing BDI–II had a p-value of .098 for association with increasing procrastination. For Initiate, Model 1 shows significance for Initiate with increasing procrastination. Model 2 shows similar significant results for Initiate. Also, increasing age approached significance ($p = .061$) with increasing procrastination. For Working Memory, Model 1 shows significance for both increasing age and Working Memory with increasing procrastination. Model 2 shows similar significant results for age and Working Memory. Also, decreasing NEO-Conscientiousness scores were significantly associated with increasing procrastination.

Table 4 shows the linear regression analyses for the executive functioning categories of Plan/Organize, Task Monitor, and Organization of Materials. For Plan/Organize, Model 1 shows significance for Plan/Organize with increasing procrastination. Model 2 shows similar significant results for Plan/Organize. Also, those without learning disabilities approached significance ($p = .050$) for increasing procrastination. For Task Monitor, Model 1 shows significance for Task Monitor with increasing procrastination. Also, increasing age approached significance ($p = .055$) with increasing procrastination. Model 2 shows similar significant results for Task Monitor, age now was also significantly associated, and decreasing NEO-Conscientiousness scores approached significance ($p = .088$) with increasing procrastination. For Organization of Materials, Model 1 shows significance for Organization of Materials with increasing procrastination. Also, increasing age had a p-value of .09 for association with increasing procrastination. Model 2 shows similar significant results for Organization of Materials, increasing age approached significance ($p = .057$) with increasing procrastination, and increasing BDI–II had a p-value of .089 for association with increasing procrastination.

TABLE 2
Linear regression analyses for predictors of executive functioning categories of inhibit, shift, and emotional control

	Inhibit Model 1		*Inhibit Model 2*		*Shift Model 1*		*Shift Model 2*		*EMOT Model 1*		*EMOT Model 2*	
Variables	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*
Constant	32.95	6.23***	28.89	13.70*	39.99	5.97***	39.216	13.61**	43.04	5.87***	43.28	13.30**
Age	0.59	0.24*	0.62	0.26*	0.50	0.25*	0.56	0.27*	0.49	0.25*	0.56	0.27*
Female	1.82	1.44	1.20	1.62	1.22	1.48	0.65	1.64	0.72	1.54	0.49	1.67
Race M	−0.16	1.27	−0.19	1.36	−0.43	1.29	−0.39	1.39	−0.12	1.33	−0.36	1.42
LD	−1.84	3.76	−4.07	4.18	−3.73	3.85	−5.42	4.25	−3.13	3.89	−5.34	4.29
ADHD	−4.53	4.80	−0.49	5.93	−2.32	4.89	1.77	6.02	−1.24	4.94	2.32	6.03
ALCH	−2.02	1.29	−2.22	1.40	−0.94	1.31	−1.42	1.42	−1.25	1.32	−1.55	1.42
PSYCH/NEUR	−0.03	3.08v	−1.52	3.52	1.35	3.13	0.16	3.55	1.76	3.16	0.22	3.57
MED PROB	2.62	2.85	2.46	2.91	3.87	2.91	3.27	2.97	4.08	2.95	3.26	2.99
DRUG	0.27	2.95	0.43	3.43	1.13	3.03	0.68	3.54	0.83	3.06	0.22	3.55
Inhibit	1.01	0.22***	0.83	0.26**	—	—	—	—	—	—	—	—
Shift	—	—	—	—	0.85	0.26**	0.44	0.32	—	—	—	—
Emotional Control	—	—	—	—	—	—	—	—	0.35	0.15*	0.09	0.19
IQ	—	—	0.09	0.10	—	—	0.07	0.10	—	—	0.06	0.10
BAI	—	—	0.03	0.08	—	—	0.06	0.08	—	—	0.07	0.08
BDI–II	—	—	0.17	0.10#	—	—	0.13	0.11	—	—	0.15	0.11
NEO-N	—	—	0.08	0.10	—	—	0.13	0.10	—	—	0.15	0.10
NEO-C	—	—	−0.20	0.10#	—	—	−0.25	0.11*	—	—	−0.27	0.11*

Note. *B* = beta; M = minority; LD = learning disability; ADHD = attention deficit hyperactivity disorder; ALCH = alcohol drinking; PSYCH/NEUR = psychiatric/neurological illness; MED PROB = major medical problems; DRUG = drug use; IQ = intelligence quotient; BAI = Beck Anxiety Inventory; BDI–II = Beck Depression Inventory–Version 2; NEO-N = NEO Neuroticism; NEO-C = NEO Conscientiousness; EMOT = emotional control. Standard errors in parentheses.
#$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

TABLE 3
Linear regression analyses for predictors of executive functioning categories of self-monitor, initiate, and working memory

	Self-Monitor Model 1		*Self-Monitor Model 2*		*Initiate Model 1*		*Initiate Model 2*		*Working Memory Model 1*		*Working Memory Model 2*	
Variables	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*
Constant	37.91	6.14***	34.85	13.52*	34.26	5.49***	34.54	12.83**	36.23	5.88***	31.26	13.55*
Age	0.618	0.25*	0.65	0.27*	0.39	0.23	0.48	0.26#	0.54	0.24*	0.58	0.26*
Female	1.13	1.48	0.28	1.63	1.31	1.38	1.09	1.58	1.31	1.44	0.86	1.61
Race M	−0.45	1.29	−0.40	1.38	−1.09	1.21	−1.19	1.35	−0.92	1.26	−0.77	1.37
LD	−3.95	3.84	−6.18	4.21	−4.72	3.60	−6.16	4.08	−4.73	3.77	−6.11	4.170
ADHD	−0.88	4.87	2.77	5.93	−1.42	4.56	1.14	5.77	−2.33	4.77	1.98	5.88
ALCH	−1.46	1.31	−1.75	1.40	−1.20	1.22	−1.71	1.36	−1.45	1.28	−1.82	1.39
PSYCH/NEUR	1.65	3.09	−0.59	3.53	1.02	2.89	0.56	3.41	1.04	3.04	−0.36	3.49
MED PROB	3.36	2.90	3.03	2.93	3.45	2.72	3.12	2.85	2.71	2.85	2.47	2.92
DRUG	0.59	3.01	0.59	3.48	0.15	2.82	0.55	3.37	0.82	2.95	0.81	3.45
Self-Monitor	0.92	0.27**	0.71	0.29*	—	—	—	—	—	—	—	—
Initiate	—	—		—	1.29	0.20***	1.15	0.28***	—	—	—	—
Working Memory	—	—		—	—	—	—	—	0.95	0.21***	0.73	0.24**
IQ	—	—	0.07	0.10	—	—	0.02	0.10	—	—	0.10	0.10
BAI	—	—	0.05	0.08	—	—	0.01	0.08	—	—	0.06	0.08
BDI–II	—	—	0.17	0.11#	—	—	0.08	0.10	—	—	0.11	0.11
NEO-N	—	—	0.14	0.10	—	—	0.04	0.10	—	—	0.11	0.10
NEO-C	—	—	−0.23	0.10*	—	—	−0.11	0.11	—	—	−0.23	0.10*

Note. *B* = beta; M = minority; LD = learning disability; ADHD = attention deficit hyperactivity disorder; ALCH = alcohol drinking; PSYCH/NEUR = psychiatric/neurological illness; MED PROB = major medical problems; DRUG = drug use; IQ = intelligence quotient; BAI = Beck Anxiety Inventory; BDI–II = Beck Depression Inventory–Version 2; NEO-N = NEO Neuroticism; NEO-C = NEO Conscientiousness. Standard errors in parentheses.
#$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

TABLE 4
Linear regression analyses for predictors of executive functioning categories of plan/organize, task monitor, and organization of materials

	Plan/Organize Model 1		*Plan/Organize Model 2*		*Task Monitor Model 1*		*Task Monitor Model 2*		*ORG MAT Model 1*		*ORG MAT Model 2*	
Variables	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*	*B (n = 212)*	*SE*	*B (n = 188)*	*SE*
Constant	33.146	5.43***	23.38	12.83#	31.38	5.94***	26.15	13.49#	38.90	5.53***	26.08	13.83#
Age	0.35	0.23	0.41	0.25	0.45	0.24#	0.52	0.26*	0.41	0.24#	0.50	0.26#
Female	1.55	1.36	1.43	1.54	2.04	1.41	1.309	1.59	1.55	1.42	1.07	1.60
Race M	−0.64	1.19	−0.86	1.30	−0.46	1.23	−0.41	1.34	−0.68	1.25	−0.50	1.36
LD	−5.85	3.56	−7.87	3.98#	−3.00	3.66	−4.91	4.10	−4.37	3.72	−6.62	4.15
ADHD	−0.38	4.51	2.25	5.58	−1.23	4.65	1.92	5.79	0.07	4.72	3.47	5.85
ALCH	−0.94	1.20	−1.15	1.32	−0.96	1.25	−1.38	1.36	−1.38	1.26	−1.65	1.38
PSYCH/NEUR	1.32	2.84	0.252	3.31	1.26	2.95	−0.34	3.43	1.76	2.98	−0.81	3.47
MED PROB	2.22	2.69	1.75	2.77	2.43	2.78	2.27	2.87	2.00	2.83	1.67	2.92
DRUG	0.65	2.78	1.53	3.28	0.62	2.88	1.17	3.40	0.19	2.91	0.99	3.43
Plan/Organize	1.15	0.17***	1.21	0.23***	—	—	—	—	—	—	—	—
Task Monitor	—	—	—	—	1.62	0.29***	1.29	0.33***	—	—	—	—
Organization of Materials	—	—	—	—	—	—	—	—	0.87	0.17***	0.77	0.22**
IQ	—	—	0.08	0.09	—	—	0.09	0.10	—	—	0.13	0.10
BAI	—	—	0.03	0.08	—	—	0.05	0.08	—	—	0.07	0.08
BDI–II	—	—	0.13	0.11	—	—	0.13	0.10	—	—	0.18	0.10#
NEO-N	—	—	−0.05	0.10	—	—	0.09	0.109	—	—	0.04	0.10
NEO-C	—	—	−0.03	0.11	—	—	−0.18	0.10#	—	—	−0.12	0.11

Note. *B* = beta; M = minority; LD = learning disability; ADHD = attention-deficit/hyperactivity disorder; ALCH = alcohol drinking; PSYCH/NEUR = psychiatric/neurological illness; MED PROB = major medical problems; DRUG = drug use; IQ = intelligence quotient; BAI = Beck Anxiety Inventory; BDI–II = Beck Depression Inventory–Version 2; NEO-N = NEO Neuroticism; NEO-C = NEO Conscientiousness; ORG MAT = organization of materials. Standard errors in parentheses. #$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

DISCUSSION

A substantial body of research reveals the prevalence of academic procrastination as a self-perceived problem for college students, with consequences ranging from reduced academic achievement and progress to increased stress and poor quality of life. To our knowledge, no research has investigated the subcomponents of self-reported executive functioning most related to procrastination in undergraduate students despite the obvious overlap between these constructs. In a diverse sample of college undergraduates aged 30 years and below, we found that all nine clinical subscales of executive functioning were significantly associated with increasing academic procrastination in a model that included personal and medical demographic characteristics. Also, in most of the analyses increasing age showed a significant or trend level association with increasing procrastination. In a second model that also included various demographics and psychological variables (i.e., intellectual, personality, mood), lower conscientiousness also showed a significant or trend-level association with increasing procrastination in the majority of analyses.

As hypothesized, the findings showed the importance of various aspects of self-reported executive functions in predicting a tendency toward academic procrastination in college students. In the second model, which included all the demographic, medical, and psychological variables, the BRIEF-A subscales of Initiate, Plan/Organize, Organization of Materials were independently associated with academic procrastination. Close attention to the abilities tapped by these subscales is warranted with an eye towards implications for remediation of problematic delay behaviors. Individuals with initiation problems typically want to succeed but have difficulty getting started and may require extensive prompts or cues to begin an activity. Those with planning and organization difficulties may fail to begin academic tasks in a timely fashion or fail to function efficiently because they do not have required objects or materials available when they finally sit down to work. They also may approach tasks in a haphazard fashion or become overwhelmed by large amounts of information (Roth et al., 2005).

While it is not surprising that initiation, planning, and organizational skills were predictive of academic procrastination, these results speak to the importance of working with students to improve these abilities. Effective strategies may involve teaching students to set proximal subgoals for their academic work along with reasonable expectations about the amount of effort required to complete a given task (Ariely & Wertenbroch, 2002; Brooke & Ruthven, 1984; Lamwers & Jazwinski, 1989; Tuckman, 1998). The use of contracts for periodic work completion, administration of weekly or repeated quizzes until topic mastery is achieved, and development of short assignments that build on one another with regular deadlines and feedback are helpful strategies. These goal-setting and achievement experiences enable students with procrastination tendencies to try out what it is like to complete assignments on time (Ackerman & Gross, 2005; Seo, 2008). They also serve to enhance self-efficacy and self-satisfaction with performance and may diminish the perceived burden or aversiveness associated with task completion (Stock & Cervone, 1990). In turn, procrastination may be reduced as deadlines seem less distant and the intention–action gap narrows (Steel, 2007).

Four other BRIEF-A clinical scales were significant predictors of procrastination—those of Inhibit, Self-Monitor, Working Memory, and Task Monitor. The Inhibit and Self-Monitor subscales measure the ability to not act on impulse and to keep track of and maintain appropriate regulatory control over behavior. It is widely known that procrastinators tend to choose short-term benefits over long-term gains, reflecting a core component of poor self-regulation (Tice & Baumeister, 1997). How then can students learn to overcome their natural preference for impulsive gratification through self-control and engagement in behaviors that facilitate attainment of long-term academic goals? Pychyl et al. (2000a) draw upon previous research by Ainslie and Haslam (1992) and suggest that students who procrastinate are seeking temporary relief from the negative or anxious affect associated with unpleasant academic tasks. Through counseling, such individuals should be less inclined towards this short-term affective improvement, which comes at the expense of long-term goal attainment and self-management. In working with such students, a first step might be to help them develop an awareness of these emotions and their role in jeopardizing achievement. Subsequently, students are trained in volitional skills (i.e., how to maintain action against competing goal tendencies while managing intrusive effects of negative affect). Related competencies include gaining control over immediate impulses through the establishment of fixed daily routines for learning and leisure activities, task persistence, and time management (Dietz, Hofer, & Fries, 2007). In addition, the skills necessary to initiate a task often need to be isolated and broken into small, attainable steps. Students can learn to be mindful of the resources required to carry out these steps and identify and troubleshoot problems that arise while drawing on both working memory and task monitoring skills (Haycock et al., 1998).

Procrastination is conceptually and empirically linked to conscientiousness, a trait reflecting responsibility, self-discipline, achievement motivation, and the careful and diligent fulfillment of obligations. In addition, conscientiousness shows an increase in young adulthood corresponding to the maturation of frontal brain regions that subserve various executive functions (Robins, Fraley, Roberts, & Trzesniewski, 2001; Welsh, Pennington, & Groisser, 1991). Our results indicated that low conscientiousness was an important predictor of procrastination, and it overrode the significance of several components of executive functioning—namely, the ability to shift from one situation or activity to another and to modulate emotional responses. While it might be tempting to target this characteristic directly, personality traits are relatively stable and enduring, and not easily modifiable. Nonetheless, some have suggested that the negative effects of low conscientiousness can be

ameliorated through techniques focused on organization and the stimulation of self-control. An easy way to increase self-control and prevent distraction is to block access to short-term temptations—for example, by training oneself to study in a library, work with a clean desktop, and/or study with the door closed (Schouwenburg, 2004). Others have highlighted the value of achievement motivation, which can be enhanced by setting more difficult academic goals and learning to enjoy performance for its own sake, reducing the aversive nature of due tasks (Costa & McCrae, 1992; Spence & Helmreich, 1983). Peer monitoring with accountability and consequences for behavioral failure and self-appraisal methods (e.g., self-tests with criteria for mastery included) also may improve academic conscientiousness (Tuckman & Schouwenburg, 2004). Questions remain, however, about the long-lasting or sustainable nature of the behavior change with these interventions. Furthermore, conscientiousness may be negatively related with flexibility and creativity (Feist, 1998; van Eerde, 2003; Wolfradt & Pretz, 2001), which may be problematic in academic situations that require innovative solutions.

Only a few other predictors yielded significant or trend-level findings. First, even within this restricted sample of undergraduates, increasing age showed a consistently strong association with higher levels of procrastination. This goes against most reported findings (Haycock et al., 1998; Howell et al., 2006; Steel, 2007; van Eerde, 2003), but may reflect the previous finding that academic procrastination increases as students advance through the educational process (Rosário et al., 2009), with college seniors procrastinating more than first-year students (Hill, Hill, Chabot, & Barrall, 1978; McCown & Roberts, 1994, as cited in Ozer et al., 2009). Perhaps the longer a student remains in school, the less enthusiastic and motivated he/she becomes or the more entrenched bad habits become. It is also possible that familial and work responsibilities increasingly limit the time one can devote to academic tasks, or students may acquire additional bad academic habits over time. These possibilities, however, need to be further explored empirically. What is clear is that older undergraduate students in the current study were at greater risk for academic procrastination and possibly represent an at-risk group for negative consequences based on dilatory behaviors.

Second, although depression has several characteristics that make it a likely suspect for causing procrastination (e.g., low energy, poor concentration), we saw only minimal, trend-level evidence for the association between increasing depressive symptoms and greater procrastination. This is consistent with recent meta-analytic findings, which concluded that depression's connection appears to be due mostly to waning energy levels, which makes tasks more aversive to pursue (Steel, 2007). Additionally, as noted by Pychyl et al. (2000a), when students are procrastinating, they may not concurrently experience negative affect because they are engaged in pleasant activities to the neglect of those found more aversive. In summarizing the effects of mood on procrastination, van Eerde (2003) observed that mood variables are just as likely to be precursors as outcomes of procrastination, and extant research provides no indication of whether to consider them as antecedents or consequences. Clearly the link between procrastination and depression is complex, and future research might be useful to further understand this relationship. Third, there was one model in which presence of a learning disability was associated with lower procrastination, perhaps due to the tendency of this student population to seek out academic help or remediation (Trainin & Swanson, 2005). This finding is in contrast to the one previously published study (Klassen, 2008a), which found that college students with learning disabilities reported higher levels of procrastination than their peers and lower levels of metacognitive self-regulation and self-efficacy for self-regulation. It is unclear what accounts for this discrepancy, but it is important to note that both the depression and learning disability findings were at trend levels and need to be replicated and clarified before conclusions can be drawn.

Contrary to our hypotheses, we did not find significance for the predictors of neuroticism and anxiety, two closely related traits. This is consistent with results of a recent meta-analyses of procrastination's possible causes and effects (Steel, 2007), which suggested that neuroticism's connection to procrastination was primarily due to impulsiveness and added little unique variance over conscientiousness (Johnson & Bloom, 1995; Lee et al., 2006; Schouwenburg & Lay, 1995). Similarly, Haycock et al. (1998) found that anxiety did not contribute significantly to the variance in procrastination and concluded that anxiety should be examined and interpreted in the context of its relationship to other variables. Steel also noted that moods are prone to change, and that procrastinators may feel remorse for their inactions at any time, perhaps after the academic semester has ended. Consequently, researchers might need to test mood at more than one time point or over longer time periods, in order to detect a relationship with procrastination. Research employing repeated measures of state anxiety over an academic semester supports the idea that procrastinators tend to experience less stress early on, but more stress later on and overall (Tice & Baumeister, 1997). Additional support comes from research that found a relationship between procrastination and anxiety but only as an increase during the last week of the course (Lay & Schouwenburg, 1993) or as a decrease at the course beginning (Towers & Flett, 2004, as cited by Steel, 2007). Clearly, the relationships between procrastination and neuroticism/mood are complex and may not be best described in a general linear fashion.

Limitations

Our findings, while suggestive that aspects of self-reported executive dysfunction are related to academic procrastination, warrant consideration in the context of study limitations. Despite its advantage as a comprehensive, ecologically sensitive measure of executive functioning, the BRIEF-A, along with all self-report instruments, is open to the criticism that it may have produced socially desirable responses or other biases. The

present findings are therefore preliminary and would be strengthened if future research were to use behavioral measures of task postponement in addition to self-report instruments (e.g., Howell et al., 2006; Milgram, Dangour, & Raviv, 1992). External correlates of executive function are also needed in the form of clinical neuropsychological measures. Seven of the nine BRIEF-A subscales showed a significant association with procrastination, and while we achieved ample sensitivity, specificity could be improved. To this end, objective neuropsychological instruments should be selected that assess domains of executive functioning indentified as important in the current study with the goal of improving our specificity and further delineating the relationship between academic procrastination and various executive functions.

Given the overrepresentation of females in social science participant pools as well as data collection time constraints, we could not recruit more males, though this would have been preferable. We attempted to address this sampling limitation by using gender and other demographic characteristics as covariates in all analyses, with no significant findings pertaining to these variables. A methodological limitation is that we did not counterbalance the ordering of tests, though we did separate the Lay from the BRIEF-A by placing one at the beginning and one at the end of the test battery. Because the Lay and BRIEF-A tap similar behaviors and cognitive styles, it might have been preferable to counterbalance to minimize the possibility that participants' responses were influenced by ordering of critical questions. This study was correlational and cross-sectional in nature, and we therefore cannot draw conclusions pertaining to directionality or predictive value of executive function difficulties to long-term procrastination and associated negative outcomes. While it is plausible that procrastinators lack executive control skills, it is also possible that both procrastination and executive dysfunction are caused by another variable or variables, and the current study was not designed to address this possibility. Similarly, it is possible that BRIEF-A scores served as a proxy for either diagnosed or undiagnosed ADHD, which by definition leads to these symptoms. However, 2% of our sample reported a diagnosis of ADHD, and the prevalence in adults is about 4% (Kessler et al., 2006). Thus, due to underreporting or underdiagnosis, we may have overlooked another 4–6 individuals, which would not have altered our overall pattern of findings. Furthermore, the current study was intended to investigate the relation between mild executive dysfunction and procrastination in a generally healthy adult sample rather than in a clinical sample for whom the pattern and overall severity of BRIEF-A scores would likely differ. Finally, we measured various aspects of task postponement but did not inquire directly about the adverse impact of such deferment on functioning. An increased understanding of the antecedents, motivational dynamics, and effects of procrastination will help to identify the appropriate strategies to remediate the problematic aspects of this behavior.

Future directions

Our findings are consistent with the conceptualization of executive functioning as central to the ability to engage in independent, goal-oriented behavior, especially in the context of unstructured, novel, or complex tasks, and suggest that procrastination could be an expression of subtle executive dysfunction—even in this group of neuropsychologically healthy young adults. Executive functions rely on a number of cortical and subcortical brain regions including prefrontal cortices, anterior cingulate gyrus, basal ganglia and diencephalic structures, cerebellum, deep white matter tracks, and parietal lobes areas. These brain areas are richly interconnected and are also linked with many additional regions that together subserve virtually all cognitive processes (Funahashi, 2001; Greene, Braet, Johnson, & Bellgrove, 2008; Roth et al., 2006). While executive dysfunction is observed in various psychiatric, neurological, and systemic disorders, our research suggests that there may be problems within cognitively healthy individuals that contribute to a vulnerability to procrastination. Future research might identify subtle neuroanatomic or functional brain abnormalities associated with procrastination. As training of cognitive strategies has been found to alter brain activity or neurochemistry (Olesen, Westerberg, & Klingberg, 2004; Roth et al., 2006; Valenzuela et al., 2003), pre–post intervention studies using neuroimaging paradigms might also provide evidence of neurobiological mediation of procrastination.

Researchers are also exploring the degree to which individual differences in executive capacity may be attributed, at least in part, to genetic variation (Goldberg & Weinberger, 2004; Kempf & Meyer-Lindenberg, 2006). Individual differences in executive function are being considered at multiple levels of analysis, including potential genotypes, proposed endophenotypes (e.g., performance on cognitive tasks that involve executive functions), and relevant phenotypes associated with executive functioning, such as temperament, personality, and psychopathology (Williams et al., 2009). If feasible, the combination of neuroimaging techniques with behavioral measures, self report, and genetics may help refine the phenotype of procrastination and inform the development of strategic individualized treatments. It will also be important to validate self-reported procrastination with external measures such as grade point average, such as number of missing or late assignments, incomplete grades, and so on.

Our results revealed increased age as a significant predictor of academic procrastination, which suggests the need to target at-risk upper level students who may be struggling to remain productive. The additional finding of low conscientiousness among procrastinating students is consistent with their characterization as less self-regulated and disciplined and suggests avenues for remediation (described above). Such interventions should account for a recent finding, which demonstrates that in addition to self-regulation skills, students must also possess the confidence to implement effective learning strategies, resist distractions, complete schoolwork, and

participate in class learning (referred to as "self-efficacy for self-regulation of learning"; Klassen, Krawchuk, & Rajani, 2008b). Thus, cognitive and behavioral strategies to improve higher order executive processes should be delivered in conjunction with attempts to build students' confidence in their ability to achieve academic success.

CONCLUSION

College students are faced with multiple tasks and deadlines that need to be accomplished within designated time frames, while much of their time is unstructured and unregulated. Because delay behaviors can have serious negative consequences, much research has focused on identifying the factors that produce and sustain academic procrastination so that effective interventions may be implemented. To our knowledge, this study was the first to investigate subcomponents of self-reported executive functioning associated with procrastination in a demographically diverse sample of college students. We found that the domains of initiation, plan/organize, organization of materials, inhibition, working memory, and task monitoring significantly predicted academic procrastination in addition to increased age and lower conscientiousness. Overall, the conceptualization of academic procrastination as a problem of executive dysfunction holds promise for researchers, educators, and practitioners who seek to understand this behavior and apply focused, strategic interventions to help alleviate its negative consequences.

Original manuscript received 8 April 2010
Revised manuscript accepted 17 August 2010
First published online 25 November 2010

REFERENCES

Ackerman, D. S., & Gross, B. L. (2005). My instructor made me do it: Task characteristics of procrastination. *Journal of Marketing Education*, *27*, 5–13.

Ainslie, G., & Haslam, N. (1992). Self control. In G. Loewenstein & J. Elster (Eds.), *Choice over time* (pp. 177–212). New York, NY: Russell Sage Foundation.

Antony, M. M., Purdon, C. L., Huta, V., & Swinson, R. P. (1998). Dimensions of perfectionism across the anxiety disorders. *Behaviour Research and Therapy*, *36*, 1143–1154.

Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological Science*, *13*, 219–224.

Arnou, R. C., Meagher, M. W., Norris, M. P., & Branson, R. (2001). Psychometric evaluation of the Beck Depression Inventory–II with primary care medical patients. *Health Psychology*, *20*, 112–119.

Beck, A. T., & Steer, R. A. (1993). *Beck Anxiety Inventory manual*. San Antonio, TX: Psychological Corporation.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory–II*. San Antonio, TX: Psychological Corporation.

Beswick, G., Rothblum, E., & Mann, L. (1988). Psychological antecedents to student procrastination. *Australian Psychologist*, *23*, 207–217.

Brooke, R. R., & Ruthven, A. J. (1984). The effects of contingency contracting on student performance in a PSI class. *Teaching of Psychology*, *11,* 87– 89.

Burka, J. B., & Yuen, L. M. (1983). *Procrastination: Why you do it, what to do about it*. Reading, MA: Addison-Wesley.

Burns, L. R., Dittman, K., Nguyen, N., & Mitchelson, J. K. (2000). Academic procrastination, perfectionism, and control: Associations with vigilant and avoidant coping. *Journal of Social Behavior and Personality*, *5*, 35–46.

Carmody, D. P. (2005). Psychometric characteristics of the Beck Depression Inventory–II with college students of diverse ethnicity. *International Journal of Psychiatry in Clinical Practice*, *9*, 22–28.

Caruso, J. C. (2000). Reliability generalization of the NEO personality scores. *Educational and Psychological Measurement*, *60*, 236–254.

Chu, A. H. C., & Choi, J. N. (2005). Rethinking procrastination: Positive effects of "active" procrastination behavior on attitudes and performance. *Journal of Social Psychology*, *145*, 245–264.

Clark, J. L., & Hill, O. W. (1994). Academic procrastination among African-American college students. *Psychological Reports*, *75*, 931–936.

Costa, P. T., Jr., & McRae, R. R. (1992). *Revised NEO personality inventory (NEO-PI-R) and NEO five-factor inventory (NEO-FFI): Professional manual*. Odessa, FL: Psychological Assessment Resources.

Dewitte, S., & Lens, W. (2000). Procrastinators lack a broad action perspective. *European Journal of Personality*, *14*, 121–140.

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*, 469–489.

Díaz-Morales, J. F., Ferrari, J. R., Díaz, K., & Argumedo, D. (2006). Factorial structure of three procrastination scales with a Spanish adult population. *European Journal of Psychological Assessment*, *22*, 132–137.

Dietz, F., Hofer, M., & Fries, S. (2007). Individual values, learning routines and academic procrastination. *British Journal of Educational Psychology*, *77*, 893–906.

Ellis, A., & Knaus, W. J. (1977). *Overcoming procrastination*. New York, NY: Institute for Rational Living.

Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review*, *2*, 290–309.

Ferrari, J. R. (1989). Reliability of academic and dispositional measures of procrastination. *Psychological Reports*, *64*, 1057–1058.

Ferrari, J. R. (1991a). Compulsive procrastination. Some self-reported personality characteristics. *Psychological Reports*, *68*, 455–458.

Ferrari, J. R. (1991b). Procrastination and project creation: Choosing easy, nondiagnostic items to avoid self-relevant information. *Journal of Social Behaviour and Personality*, *6*, 619–628.

Ferrari, J. R. (2001). Procrastination as self-regulation failure of performance: Effects of cognitive load, self-awareness, and time limits on "working best under pressure". *European Journal of Personality*, *15*, 391–406.

Ferrari, J. R., & Emmons, R. A. (1995). Methods of procrastination and their relation to self-control and self-reinforcement. *Journal of Social Behavior and Personality*, *10*, 135–142.

Ferrari, J. R., Johnson, J. L., & McCown, W. G. (1995). *Procrastination and task avoidance: Theory, research and treatment*. New York, NY: Plenum Press.

Ferrari, J. R., Parker, J. T., & Ware, C. B. (1992). Academic procrastination: Personality correlates with Myers-Briggs types, self-efficacy, and academic locus of control. *Journal of Social Behavior and Personality*, *7*, 495–502.

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*, 73–83.

Funahashi, S. (2001). Neuronal mechanisms of executive control by the prefrontal cortex. *Neuroscience Research*, *39*, 147–165.

Goldberg, T. E., & Weinberger, D. R. (2004). Genes and the parsing of cognitive processes. *Trends in Cognitive Science*, *8*, 325–335.

Greene, C. M., Braet, W., Johnson, K. A., & Bellgrove, M. A. (2008). Imaging the genetics of executive function. *Biological Psychiatry*, *79*, 30–42.

Haycock, L. A., McCarthy, P., & Skay, C. L. (1998). Procrastination in college students: The role of self-efficacy and anxiety. *Journal of Counseling and Development*, *76*, 317–324.

Hess, B., Sherman, M. F., & Goodman, M. (2000). Eveningness predicts academic procrastination: The mediating role of neuroticism. *Journal of Social Behavior and Personality*, *15*, 61–74.

Hill, M., Hill, D., Chabot, A., & Barrall, J. (1978). A survey of college faculty and student procrastination. *College Student Journal*, *12*, 256–262.

Holden, R. R. (1992). Associations between the Holden Psychological Screening Inventory and the NEO Five-Factor Inventory in a nonclinical sample. *Psychological Reports*, *71*, 1039–1042.

Howell, A. J., & Watson, D. C. (2007). Procrastination: Associations with achievement goal orientation and learning strategies. *Personality and Individual Differences*, *43*, 167–178.

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*, 1519–1530.

Jamrozinski, K., Kuda, M., & Mangholz, A. (2009). Academic procrastination in clients of a psychotherapeutic student counseling center. *Psychotherapie, Psychosomatik, Medizinische Psychologie*, *59*, 370–375.

Janssen, T., & Carton, J. S. (1999). The effects of locus of control and task difficulty on procrastination. *Journal of Genetic Psychology*, *160*, 436–442.

John, O. P., & Srivastava, S. (1999). The Big-Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (Vol. 2, pp. 102–138). New York, NY: Guilford Press.

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*, 127–133.

Judge, T. A., & Bono, J. E. (2001). Relationship of core self-evaluations traits—self-esteem, generalized self-efficacy, locus of control, and emotional stability—with job satisfaction and job performance: A meta-analysis. *Journal of Applied Psychology*, *86*, 80–92.

Kachgal, M. M., Hansen, S. L., & Nutter, K. J. (2001). Academic procrastination/intervention: Strategies and recommendations. *Journal of Developmental Education*, *25*, 14–24.

Kempf, L., & Meyer-Lindenberg, A. (2006). Imaging genetics and psychiatry. *Focus: The Journal of Lifelong Learning in Psychiatry*, *4*, 327–338.

Kessler, R. C., Adler, L., Barkley, R., Biederman, J., Conners, K., Demler, O., et al. (2006). The prevalence and correlates of adult ADHD in the United States: Results from the National Comorbidity Survey Replication. *American Journal of Psychiatry*, *163*, 716–723.

Klassen, R. M., Krawchuk, L. L., Lynch, S. L., & Rajani, S. (2008a). Procrastination and motivation of undergraduates with learning disabilities: A mixed-methods inquiry. *Learning Disabilities Research and Practice*, *23*, 137–147.

Klassen, R. M., Krawchuk, L. L., & Rajani, S. (2008b). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemporary Educational Psychology*, *33*, 915–931.

Lamwers, L. L., & Jazwinski, C. H. (1989). A comparison of three strategies to reduce student procrastination in PSI. *Teaching of Psychology*, *16*, 8–12.

Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in Personality*, *20*, 474–495.

Lay, C. H. (1988). The relationship of procrastination and optimism to judgments of time to complete an essay and anticipation of setbacks. *Journal of Social Behavior and Personality*, *3*, 201–214.

Lay, C. H. (2004). Some basic elements in counseling procrastinators. In H. C. Schouwenburg, C. Lay, T. Pychyl, & J. R. Ferrari (Eds.), *Counseling the procrastinator in academic settings* (pp. 43–58). Washington, DC: American Psychological Association.

Lay, C. H., & Burns, P. (1991). Intentions and behavior in studying for an exam: The role of trait procrastination and its interaction with optimism. *Journal of Social Behavior and Personality*, *6*, 605–617.

Lay, C. H., & Schouwenburg, H. C. (1993). Trait procrastination, time management, and academic behavior. *Journal of Social Behavior & Personality*, *8*, 647–662.

Lee, D. G., Kelly, K. R., & Edwards, J. K. (2006). A closer look at the relationships among trait procrastination, neuroticism, and conscientiousness. *Personality and Individual Differences*, *40*, 27–37.

Matthews, G., Deary, I., & Whiteman, M. (2003). *Personality traits* (3rd ed.). Cambridge, UK: Cambridge University Press.

McCown, W., & Roberts, R. (1994). *A study of academic and work-related dysfunctioning relevant to college version of an indirect measure of impulsive behavior* (Integra Technical Paper No. 94-128). Randor, PA: Integra.

Milgram, N. A., Dangour, W., & Raviv, A. (1992). Situational and personal determinants of academic procrastination. *Journal of General Psychology*, *119*, 123–133.

Milgram, N., Marshevsky, S., & Sadeh, A. (1994). Correlates of academic procrastination: Discomfort, task aversiveness, and task capability. *The Journal of Psychology*, *129*, 145–155.

Milgram, N., & Tenne, R. (2000). Personality correlates of decisional and task avoidant procrastination. *European Journal of Personality*, *14*, 141–156.

Moon, S. M., & Illingworth, A. J. (2005a). Exploring the dynamic nature of procrastination: A latent growth curve analysis of academic procrastination. *Personality and Individual Differences*, *38*, 297–309.

Nixon, S. J., Parsons, O. A., Schaeffer, K. W., & Hale, R. L. (1995). A methodological study of the Shipley Institute of Living Scale in alcoholics and non-alcoholics: Reliability, discriminating items and alternate forms. *Applied Neuropsychology*, *2*, 155–160.

Olesen, P., Westerberg, H., & Klingberg, T. (2004). Increased prefrontal and parietal activity after training of working memory. *Nature Neuroscience 7*, 75–79.

Onwuegbuzie, A. J. (2004). Academic procrastination and statistics anxiety. *Assessment and Evaluation in Higher Education*, *29*, 3–19.

Osman, A., Kopper, B. A., Barrios, F. X., Osman, J. R., & Wade, T. (1997). The Beck Anxiety Inventory: Reexamination of factor structure and psychometric properties. *Journal of Clinical Psychology*, *53*, 7–14.

Ozer, B. U., Demir, A., & Ferrari, J. R. (2009). Exploring academic procrastination among Turkish students: Possible gender differences in prevalence and reasons. *Journal of Social Psychology*, *149*, 241–257.

Phay, A. P. (1990). The Shipley Institute of Living Scale: Part 2. Assessment of intelligence and cognitive deterioration. *Medical Psychotherapy*, *3*, 17–35.

Prohaska, V., Morrill, P., Atiles, I., & Perez, A. (2000). Academic procrastination by nontraditional students. *Journal of Social Behavior and Personality*, *15*, 125–134.

Pychyl, T. A., Coplan, R. J., & Reid, P. A. (2002). Parenting and procrastination: Gender differences in the relations between procrastination, parenting style and self-worth in early adolescence. *Personality and Individual Differences*, *33*, 271–285.

Pychyl, T. A., Lee, J. M., Thibodeau, R., & Blunt, A. (2000a). Five days of emotion: An experience sampling study of

undergraduate student procrastination. *Journal of Social Behavior and Personality*, *15*, 239–254

Pychyl, T. A., Morin, R. W., & Salmon, B. R. (2000b). Procrastination and the planning fallacy: An examination of the study habits of university students. *Journal of Social Behavior and Personality*, *15*, 135–150.

Robins, R. W., Fraley, R. C., Roberts, B. W., & Trzesniewksi, K. H. (2001). A longitudinal study of personality change in young adulthood. *Journal of Personality*, *64*, 618–640.

Rosário, P., Costa, M., Núñez, J. C., González-Pienda, J., Solano, P., & Valle, A. (2009). Academic procrastination: Associations with personal, school, and family variables. *Spanish Journal of Psychology*, *12*, 118–127.

Roth, R. M., Isquith, P. K., & Gioia, G. A. (2005). *Behavior Rating Inventory of Executive Function–Adult Version*. Lutz, FL: Psychological Assessment Resources.

Roth, R. M., Randolph, J. J., Koven, N. S., & Isquith, P. K. (2006). Neural substrates of executive functions: Insights from functional neuroimaging. In J. R. Dupri (Ed.), *Focus on neuropsychology research* (pp. 1–36). New York, NY: Nova Science Publishers.

Rothblum, E. D., Solomon, L. J., & Murakami, J. (1986). Affective, cognitive, and behavioral differences between high and low procrastinators. *Journal of Counseling Psychology*, *33*, 387–394.

Safren, S. (2006). Cognitive-behavioral approaches to ADHD treatment in adulthood. *Journal of Clinical Psychiatry*, *67*(Suppl. 8), 46–50.

Schouwenburg, H. C. (2004). Academic procrastination: Theoretical notions, measurement, and research. In H. C. Schouwenburg, C. H. Lay, T. A. Pychyl, & J. R. Ferrari (Eds.), *Counseling the procrastinator in academic settings* (pp. 3–17). Washington, DC: American Psychological Association.

Schouwenburg, H. C., & Groenewoud, J. T. (2001). Study motivation under social temptation: Effects of trait procrastination. *Personality and Individual Differences*, *30*, 229–240.

Schouwenburg, H. C., & Lay, C. H. (1995). Trait procrastination and the Big Five factors of personality. *Personality and Individual Differences*, *18*, 481–490.

Senécal, C., Koestner, R., & Vallerand, R. J. (1995). Self-regulation and academic procrastination. *Journal of Social Psychology*, *135*, 607–619.

Seo, E. H. (2008). Self-efficacy as a mediator in the relationship between self-oriented perfectionism and academic procrastination. *Social Behavior and Personality*, *36*, 753–763.

Shanahan, M. J., & Pychyl, T. A. (2007). An ego identity perspective on volitional action: Identity status, agency, and procrastination. *Personality and Individual Differences 43*, 901–911.

Shipley, W. C. (1991). *Shipley Institute of Living Scale*. Los Angeles, CA: Western Psychological Services.

Smith, D. E., & McCrady, B. S. (1991). Cognitive impairment among alcoholics impacts on drink refusal skill acquisition and treatment outcome. *Addictive Behavior*, *16*, 265–274.

Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: Frequency and cognitive-behavioural correlates. *Journal of Counseling Psychology*, *31*, 504–510.

Spence, J. T., & Helmreich, R. L. (1983). Achievement-related motives and behavior. In J. T. Spence (Ed.), *Achievement and achievement motives: Psychological and sociological approaches* (pp. 10–74). San Francisco, CA: Freeman.

Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin*, *133*, 65–94.

Steel, P., Brothen, T., & Wambach, C. (2001). Procrastination and personality, performance, and mood. *Personality and Individual Differences*, *30*, 95–106.

Stock, J., & Cervone, D. (1990). Proximal goal-setting and self-regulatory processes. *Cognitive Therapy and Research*, *14*, 483–498.

Stoeber, J., & Joormann, J. (2001). Worry, procrastination and perfectionism: Differentiating amount of worry, pathological worry, anxiety and depression. *Cognitive Therapy and Research*, *25*, 49–60.

Stone, D. A. (1999). *The neuropsychological correlates of severe academic procrastination*. Unpublished doctoral dissertation, University of Michigan, Ann Arbor.

Strub, R. L. (1989). Frontal lobe syndrome in a patient with bilateral globus pallidus lesions. *Archives of Neurology*, *46*, 1024–1027.

Stuss, D. T., & Benson, D. F. (1986). *The frontal lobes*. New York, NY: Raven.

Tan, C. X., Ang, R. P., Klassen, R. M., Yeo, L. S., Wong, I. Y. F, Huan, V. S., et al. (2008). Correlates of academic procrastination and students' grade goals. *Current Psychology*, *27*, 135–144.

Tice, D. M., & Baumeister, R. F. (1997). Longitudinal study of procrastination, performance, stress and health: The costs and benefits of dawdling. *Psychological Science*, *8*, 454–458.

Towers, A., & Flett, R. (2004). *Why put it off? Understanding student procrastination over time*. Unpublished manuscript, Massey University, Palmerston North, New Zealand.

Trainin, G., & Swanson, H. L. (2005). Cognition, metacognition, and achievement of college students with learning disabilities. *Learning Disability Quarterly*, *28*, 261–272.

Tuckman, B. W. (1998). Using tests as an incentive to motivate procrastinators to study. *Journal of Experimental Education*, *66*, 141–147.

Tuckman, B. W., & Schouwenburg, H. C. (2004). Behavioral interventions for reducing procrastination among university students. In H. C. Schouwenburg, C. H. Lay, T. A. Pychyl, & J. R. Ferrari (Eds.), *Counseling the procrastinator in academic settings* (pp. 91–103). Washington, DC: American Psychological Association.

Valenzuela, M., Jones, M., Wen, W., Rae, C., Graham, S., Shnier, R., et al. (2003). Memory training alters hippocampal neurochemistry in healthy elderly. *Neuroreport*, *14*, 1333–1337.

van Eerde, W. (2000). Procrastination: Self-regulation in initiating aversive goals. *Applied Psychology: An International Review*, *49*, 372–389.

van Eerde, W. (2003). A meta-analytically derived nomological network of procrastination. *Personality and Individual Differences*, *35*, 1401–1418.

Weiss, M., & Murray, C. (2003). Assessment and management of attention-deficit hyperactivity disorder in adults. *Canadian Medical Association Journal*, *168*, 715–22.

Welsh, M. C., Pennington, B. F., & Groisser, D. B. (1991). A normative-developmental study of executive function: A window on prefrontal function in children. *Developmental Neuropsychology*, *7*, 131–149.

Williams, P. G., Suchy, Y., & Rau, H. K. (2009). Individual differences in executive functioning: Implications for stress regulation. *Annals of Behavioral Medicine*, *37*, 126–140.

Wolfradt, U., & Pretz, J. E. (2001). Individual differences in creativity: Personality, story writing, and hobbies. *European Journal of Personality*, *15*, 297–310.

Wolters, C. A. (2003). Understanding procrastination from a self-regulated learning perspective. *Journal of Educational Psychology*, *95*, 179–187.

Zachary, R. A., Crumpton, E., & Spiegel, D. (1985). Estimating WAIS–R IQ from the Shipley Institute of Living Scale. *Journal of Clinical Psychology*, *41*, 532–540.

Ziesat, H. A., Rosenthal, T. L., & White, G. M. (1978). Behavioral self-control in treating procrastination of studying. *Psychological Reports*, *42*, 56–69.