

## Procrastination, Temptations, and Incentives: The Struggle between the Present and the Future in Procrastinators and the Punctual

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### Abstract

Two studies investigated the role of impulsivity in procrastinators' problems. In the first study, 147 freshmen completed questionnaires measuring the Big Five personality factors, a broad impulsivity scale, and Lay's general procrastination scale, and their perceptions concerning a compulsory course. The data revealed that procrastination was closely related to a lack of perseverance, that is, the inability to complete projects. This relation explained a large part of the well documented relation between conscientiousness and procrastination. In the second study, a subsample of these students was followed up during 11 weeks before their exams. They had to provide their study intentions and behaviour, the reasons why they failed to enact their intentions, and the perceived impact of studying on their final grade. The data revealed that all students tend to postpone the bulk of their study activities to the last week before an exam, and that this trend could nicely be described by a hyperbolic curve. The results also revealed that procrastinators postponed more of their intentions, mainly because of fun alternatives, but did not intend to study less or later. On the contrary, they even seemed to compensate for their vulnerability by formulating more intentions earlier. Procrastinators emerged as highly motivated students who lack the ability to ward off temptations and distractions during their studying activities. Copyright © 2002 John Wiley & Sons, Ltd.

### INTRODUCTION

Everybody procrastinates from time to time. However, some people tend to procrastinate habitually, regardless of the situation; they are called procrastinators, while people who do not have this habit may be designated as punctual. Procrastinators tend to score high on questionnaires measuring the personality trait procrastination (Lay, 1986), while punctual people tend to score low.

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Procrastination is a behavioural tendency with potentially damaging consequences for the person suffering from it. The most typical symptom of procrastination is underperformance: because of their tendency to start late, procrastinators do not have enough time to perform at the level their capacities would allow (Ferrari, Johnson, & McCown, 1995). Further, for some procrastinators, this causes emotional troubles (Lay, 1995; Milgram & Naaman, 1996). Recently, much empirical research has been reported investigating some of its personality correlates (Johnson & Bloom, 1995; Lay, Kovacs, & Danto, 1998; Milgram & Tenne, 2000; Schouwenburg & Lay, 1995; Watson, 2001), its behavioural consequences (Dewitte & Lens, 2000a; Steel, Brothen, & Wambach, 2001), or both (Dewitte & Lens, 2000b; Lay, 1997; Lay & Brokenshire, 1997). The basic message seems to be that Conscientiousness, one of the Big Five factors of human personality (see e.g. Costa & McCrae, 1992), explains the lion's share of the variation in procrastination items, whatever measure is used for the latter.

However, much less is known about the underlying processes, of which the main stream can be characterized by the following sequence:

future examination → intention to study → actual study behaviour → eventual passing  
 (distant goal)                    (intention)                    (behaviour)                    (outcome)

What happens when a procrastinator postpones one of his or her intentions, and why is he or she more likely to do so than other people? From a practical point of view, knowing what happens in real time might be as relevant as understanding personality correlates of procrastination, because this will allow teachers or employers to design situations that minimize the negative effects of procrastination. A recent study by Schouwenburg and Groenewoud (2001) tackled this question by letting students imagine how much time was left before the exams. They found that everyone would study less and would give in more to social temptations when the exams were remote than when they were near. That is, people discount the value of a future reward (i.e. passing the exam) with time, which is a general phenomenon that has been reported in self-control literature (Ainslie, 1992; Bernheim, 1994; Logue, 1988; Ostaszewski, 1997; Rachlin, 1995). However, Schouwenburg and Groenewoud (2001) found, as they had expected, that procrastinators discounted the future reward to a larger extent than did very and moderately punctual students. Nevertheless, time-related increases in both study motivation and resistance to social temptation did not differ as a function of trait procrastination. This suggested that procrastinators do not have motivational deficits, and may not have more troubles resisting social temptations than others. Rather, the core of the problem might be situated in their problem in enacting their intentions (see also Steel et al., 2001). The present paper attempts to add to the growing understanding of what drives (or fails to drive) procrastinators when they have to work towards a distant goal.

### **Lack of inhibition or lack of facilitation?**

Two basic mechanisms might underlie the relation between a lack of self-control (low success in goal attainment) and procrastination: a facilitatory or inhibitory failure (Carver & Scheier, 1999). First, procrastinators may have more troubles resisting temptations than do the punctual, for instance because of the need to relieve bad moods or feelings of dejection, which are reported to occur more frequently in procrastinators (Lay, 1995). To cope with these negative affects, they may be more impulsive than their punctual

counterparts. Second, procrastinators may have troubles appreciating the consequences that present choices have for the viability of remote goals. That is, they may underestimate the relevance of the present efforts (e.g. studying) for their final success (e.g. passing the exam) (Dewitte & Lens, 2000a). The first option would imply that procrastinators suffer from a lack of inhibition of competing activities, and the second one pictures procrastinators as suffering from a lack of facilitation of relevant (e.g. study) activities.

The two hypotheses have diverging implications, which will be tested using different methodologies. First, the two hypotheses have implications for the types of intermediate trait that may explain the relation between the higher order trait Conscientiousness and the lower order trait procrastination. If procrastination is a matter of low inhibition, a high sensitivity to temptations should mediate the relation between Conscientiousness and trait procrastination. If, on the other hand, procrastination is a matter of low facilitation (or motivation), a lack of persistence should mediate the relation between both traits. Second, the two hypotheses have implications for the way intentions and their enactment evolve on a week-to-week basis during a semester for procrastinators and the punctual. If inhibition is the core problem in procrastination, procrastinators should report having more trouble resisting temptations, and this failure should be the main reason why they postpone more of their intentions. On the other hand, if facilitation is the culprit in procrastination, procrastinators should underestimate the link between the present behaviour and the distant goal more than do the punctual, and hence have fewer intentions (at least when the goal is remote). Previous evidence on the role of impulsivity in procrastination is ambiguous. Ferrari (1993) reported higher (dysfunctional) impulsivity for procrastinators than for punctual people. Ferrari and Emmons (1995) reported that self-control (which they interpreted as the disability to control the desire for short-term, pleasurable activities) was strongly related to trait procrastination. On the other hand, Schouwenburg and Groenewoud (2001) did not find evidence for a difference in impulsivity between procrastinators and the punctual. However, their findings relied on imaginative data. For instance, they asked students to imagine how they would react to situations such as these: 'A friend comes and asks you to join him for a party, although you have intended to study that night'. Participants had to imagine their behaviour for different delays until the final exam at which this event happened. Possibly, estimating how one would react to an occurring temptation is driven more by one's intentions (e.g. not to give in) than by one's actual vulnerability. Indeed, one of the hallmarks of impulsivity (more specifically Urgency) is the engagement in behaviours *that one does not want to do*, for instance in order to soothe negative moods (Whiteside & Lynam, 2001). This implies that high scorers on this aspect of impulsivity do not necessarily *know* that they will not be able to resist a temptation when it really presents itself, but nevertheless procrastinate on a task at hand while giving in to a temptation. In contrast, items gauging trait procrastination refer to actual dilatory behaviour that has or has not occurred several times in the past. We believe that distortion is less severe in such cases. In sum, the hypothesis that (aspects of) impulsivity explains the link between conscientiousness and trait procrastination deserves a new test.

### The present study

As mentioned above, we used two different methodologies to test both hypotheses in two ways. In the first phase of the present study, taking place about 11 weeks before the final exams, students were assigned questionnaires measuring their score on the Big Five personality domains (Berkeley Personality Profile; Harary & Donahue, 1994a, 1994b), a

broad Impulsivity test (UPPS, measuring four aspects of impulsivity: Urgency, Perseverance, Premeditation, and Sensation seeking, Whiteside & Lynam, 2001), a test for trait procrastination (Lay, 1986; Schouwenburg, 1994), and questions concerning the expected impact of studying on their final grade for an important but unattractive course.

The second part involved an electronic measurement repeated weekly in a subsample of the first study. We measured study intentions for the coming week, study behaviour during the past week, the expected impact on final grades of studying that week, and the reason why they failed to enact their intentions the past week (if they did at all). The reasons participants could choose among were the following: people could postpone their intentions because of fatigue, more pleasant endeavours (Schouwenburg & Groenewoud, 2001), external (social) pressure, or changes in study intentions (i.e. studying for a different course).

In the first phase of this study, we used the recently developed Impulsivity test of Whiteside and Lynam (UPPS, 2001). Starting from a broad battery of available impulsivity scales and some additional items that were lacking from extant literature, they constructed a questionnaire measuring all aspects of impulsivity that have been investigated in the past. Four distinct factors were extracted. The first factor was dubbed (lack of) Perseverance, defined as the tendency (not) to finish jobs when started. This factor might reflect a lack of facilitation, and is strongly related to Conscientiousness and all of its facets, except Deliberation. Second, (lack of) Premeditation emerged as an important factor, reflecting the tendency (not) to think things over before getting into action. This scale is strongly related to the Deliberation facet of the Conscientiousness dimension. It is less clear whether this factor reflects facilitation or inhibition. Thinking about consequences might both be motivating or inhibiting. Third, a factor called Urgency emerged, reflecting the tendency to act on the spur of the moment in order to relieve negative moods. That is, this version of impulsivity (related to Neuroticism, especially the 'Impulsivity' facet) serves to relieve tension and negative affect. However, coping with negative affect in this way usually does not get the person out of trouble, because the long-term consequences of impulsive behaviours are often problematic themselves. The definition of this aspect does not leave much doubt that it reflects a lack of inhibition. Finally, Sensation seeking (factor 4) reflects the tendency to strive for novel experiences and take risks.

We expected that procrastinators could be characterized by at least three of these four sub-types of Impulsivity. First, Urgency scores might be higher among them because one of the characteristics of procrastinators seems to be their worrying about their dilatory behaviour (Milgram & Naaman, 1996; however, see Steel et al., 2001). This very worrying makes them feel bad more often than the punctual, which might trigger the urge to relieve tension and give in to temptations (see e.g. Tice, Bratslavsky, & Baumeister, 2001). In contrast, procrastinators may lack Perseverance. The major support for this hypothesis is empirical. Because the Conscientiousness dimension is saturated with items related to Perseverance (Whiteside & Lynam, 2001), and because it is strongly related to trait procrastination (see e.g. Schouwenburg & Lay, 1995), it is likely that procrastinators will be low in Perseverance. However, if trait procrastination reflects the failure to initiate activities that lead to one's goal, this does not imply that they do not finish what they started. On the other hand, if finishing what one starts reflects long-term projects (such as studying for an exam), it is obvious that failing to initiate short-term activities (e.g. studying one particular chapter) damages overall project completion (e.g. mastering the whole course).

The third aspect of Impulsivity that we expected to be related to trait procrastination was (lack of) Premeditation. Specifically, procrastinators may usually fail to think their activities over in terms of their consequences. Therefore, they may fail to appreciate that

studying at this very moment increases their ultimate chances for success (Dewitte & Lens, 2000a), or, conversely, that not studying at this very moment damages their chances for success. Finally, we were less sure about the role of Sensation seeking. On the one hand, there is some empirical evidence that suggests that procrastination is related to sensation seeking or related constructs (Ferrari, 1992a; Ferrari, 2000). On the other hand, seeking novel experiences may not only divert one from studying (a possible negative effect) but may also lead one to dig deeper into it (a possible positive effect). The fairly simple hypotheses were that procrastinators would score higher on Urgency and lower on Premeditation and Perseverance. The more sophisticated hypotheses were that the relation between conscientiousness and procrastination would be mediated by these three constructs. Moreover, the hierarchy of this mediational analysis would suggest whether procrastination was a matter of lack of inhibition or facilitation. If Urgency were to dominate the path between conscientiousness and procrastination, then the lack of inhibition hypothesis would be favoured. If Perseverance were to dominate that path, the lack of facilitation hypothesis would be favoured. Further, the weaker relation that has been found between Neuroticism and trait procrastination (Johnson & Bloom, 1995; Schouwenburg & Lay, 1995; Steel et al., 2001) was expected to be mediated by Urgency.

In the second phase of the present study, these hypotheses were tested by means of a different methodology. If procrastinators can be characterized by lower levels of inhibition, they are expected to postpone due to temptations (i.e. giving in to fun alternatives) more often than the punctual. For other reasons (fatigue, study schedule changes, and external reasons), no differences were expected between procrastinators and the punctual. If procrastinators lack facilitation, they should be less influenced by remote future events and rewards than others. In line with this, Dewitte and Lens (2000a) reported that procrastinators described their studying activities less often in terms of remote goals or, in other words, by means of high action identities (Vallacher & Wegner, 1987). High action identities are action descriptions that define the present activity in terms of its broader context, its guiding goals, or its (unintended but appreciated) consequences. Typical items that procrastinators endorsed to a lesser extent than the punctual were 'Studying is preparing for the exams', 'Studying is making sure that I pass', and so on. Further, Specter and Ferrari (2000) found negative correlations between procrastination and future time orientation (i.e. the extent to which a person takes into account the future). This lack of insight into one's future that was documented in the two papers just mentioned might be an important mechanism behind dilatory behaviour. Specifically, procrastinators might fail to increase motivation related to required activities and hence fail to engage in them (Ainslie, 1992; Atkinson & Birch, 1986; Metcalfe & Mischel, 1999). Based on this hypothesis, we expected that the evolution of study behaviour would parallel the evolution in expected impact of currently studying on the final outcome. That is, procrastinators might fail to see the relevance of currently studying and therefore postpone their intentions much longer than do the punctual.

## FIRST PHASE OF THE STUDY

### Method

#### *Participants*

Participants were 147 freshmen (130 women (88.4%), 17 men) enrolled in educational sciences at the University of Leuven (Belgium, Dutch speaking part). Their ages ranged

from 17 to 42 ( $M = 18.6$ ,  $SD = 2.1$ ). They received a battery of tests during one of their regular lectures. In addition to these tests (described below), they had to complete some additional items concerning an obligatory course they were taking ('Introduction to statistics', an important but rather aversive course that is needed for their training as an educational scientist). On the final page, they were also invited to participate in a follow-up study proceeding by means of a weekly e-mailed questionnaire until the final exams. The items (measuring some aspects of the course) they would receive on a weekly basis were presented to help them decide. Further, they were told that simply participating and expressing one's intentions may enhance study behaviour. The condition for participation was that they had an e-mail address that they checked at least once a week. They were assured that they were allowed to quit the study at any time without any consequences. Volunteers simply had to identify by providing their e-mail address. Fifty-four complied with this request (36.7%). Completion took about 20 minutes.

### *Instruments*

First, participants completed the (new) Dutch translation of the UPPS (Whiteside & Lynam, 2001), consisting of four scales (45 items) measuring Urgency, Perseverance, Premeditation, and Sensation seeking. They then provided their gender and age. They completed the validated Dutch translation of Lay's general Procrastination scale (1986, 20 items, translated and validated by Schouwenburg, 1994). They also completed the validated short Dutch version of the Berkeley Personality Profile (35 items, Harary & Donahue, 1994b) measuring the Big Five personality domains with seven items for each domain. Finally, several questions were presented concerning the course 'Introduction to statistics'. Students had to provide the number of hours they intended to study next week and the number of hours they had actually studied for that course during the past week. They then had to estimate how many points their grade would increase by studying 5 hours during the next week in comparison with no studying at all (perceived impact of studying). They had to do so on a 12-point scale. In the system these students were enrolled in, grades range from zero to 20. They pass if they obtain ten points out of 20. They were presented with a scale from zero to two additional points (with step 0.2) and one additional option greater than two. Then they had to rate the importance of succeeding (on a eight-point scale from zero to seven). Finally, they had to provide their aspiration level (expressed by the grade they strove for from zero to 20).

## **Results**

### *Instruments*

*Impulsivity.* An initial factor analysis with four factors explained 42% of the variance in the 45 items measuring the four aspects of impulsivity. Subsequently, six items were deleted. Three items loaded on the wrong factor: 'My thinking is usually careful and purposeful' loaded on Perseverance rather than on Premeditation; 'I am not one of those people who blurt out things without thinking' loaded negatively on Urgency rather than on Premeditation; and 'I'll try anything once' loaded negatively on Premeditation rather than on Sensation seeking, which are all plausible discrepancies. Further, three items loaded very poorly on the intended factor: 'I don't like to start a project until I know exactly how to proceed' (Premeditation, 0.34), 'It is hard for me to resist acting on my feelings' (Urgency, 0.18); and 'I would enjoy fast driving' (Sensation seeking, 0.17). The deviation from the original pattern may be due to the translation process and to cultural differences, but also to the fact that the UPSS is a very recently constructed instrument. With the 39

items remaining, four factors explained 46% of the variance. The number of items and Cronbach's alphas are Premeditation, eight items, 0.79; Urgency, 11 items, 0.83; Sensation seeking, ten items, 0.88; and Perseverance, ten items, 0.84.<sup>1</sup>

*Berkeley personality profile (Dutch version) and procrastination.* Given the widespread use of both questionnaires, only internal consistencies are provided. Lay's procrastination (Schouwenburg's 1994 Dutch translation) was internally consistent:  $\alpha = 0.89$ . Concerning the Big Five, each factor was measured with seven items. We next list the five subscales, their internal consistency in our sample, the number of items, and, if applicable, the items that we excluded from the scale to reach an acceptable alpha. The scales were (i) Neuroticism ( $\alpha = 0.85$ ,  $n = 7$ ); (ii) Extraversion ( $\alpha = 0.85$ ,  $n = 7$ ); (iii) Openness ( $\alpha = 0.77$ ,  $n = 5$ , without the items 'is a person who] prefers work that is routine and simple', loading = 0.24, and 'is a person who] is ingenious, a deep thinker', loading = 0.37, both loading slightly higher (and negative) on Agreeableness); (iv) Conscientiousness ( $\alpha = 0.73$ ,  $n = 6$ , without the item 'is a person who] can be somewhat careless'), which loaded higher and negatively on Neuroticism). The fifth dimension (Agreeableness) did not come out well ( $\alpha = 0.55$ , with  $n = 3$ ; 'is a person who] likes to cooperate with others') and 27 ('is a person who] is generally trusting') loaded very low on all factors and items 12 ('is a person who] can be cold and aloof') and 22 ('is a person who] is sometimes rude to others') had higher (negative) loading on Extraversion). Therefore, the fifth dimension will not be used in the remaining analysis. This is not dramatic for our purposes, because Agreeableness was irrelevant for the hypotheses to be tested.

#### *Dispositional antecedents of procrastination*

The initial model we submitted to a path analysis had three major parts: four personality factors on the left-hand side (the Big Five minus Agreeableness), the four impulsivity scales as intermediate variables, and trait procrastination as the criterion. The intercorrelations of all the variables included are presented in Table 1. Following

Table 1. The intercorrelations (decimals omitted) of the input, intermediate, and criterion variables of the proposed linear model (phase 1)

	Domains			Aspects of impulsivity				
	2	3	4	5	6	7	8	9
1. Extraversion	24*	05	21*	-25*	06	<b>38</b>	17*	-11
2. Neuroticism-		07	18*	-02	-37	20*	14	-10
3. Conscientiousness			-05	<b>38</b>	-46	-11	<b>64</b>	-69
4. Openness				-06	-04	26*	00	-06
5. Premeditation				<i>0.24</i>	-39	-32	<b>32</b>	-38
6. Urgency					<i>0.38</i>	10	-38	<b>39</b>
7. Sensation seeking						<i>0.23</i>	02	08
8. Perseverance							<i>0.43</i>	-72
9. Procrastination								<i>0.61</i>

$n = 147$ .

Boldface  $p < 0.0001$ ; \* $p < 0.05$ .

In italics on the diagonal is the explained variance in the fitting path model (Figure 1).

<sup>1</sup>Our Dutch translation of the UPSS scale and the factor loadings in our sample can be requested from either author.

Whiteside and Lynam (2001), we included paths from Conscientiousness to Perseverance and Premeditation, from Extraversion to Sensation seeking, and from Neuroticism to Urgency. No paths left Openness. Following Schouwenburg and Lay (1995), we included paths to procrastination from Perseverance (given that the Conscientiousness factor is saturated with Perseverance items), from Urgency (see Tice et al., 2001), and from Premeditation. Further, because the relation between Conscientiousness and procrastination could also be due to Urgency, we included a path from Conscientiousness to Urgency. Finally, following Ferrari (1992a), we included a path from Sensation seeking to procrastination. Initially, no direct path from Conscientiousness to procrastination was included because we suspected that Premeditation and Perseverance would mediate this relation.

The initial model fitted poorly (adjusted goodness of fit (AGFI)=0.75;  $\chi^2(DF = 16) = 78.0, p < 0.0001$ ). Modification indices suggested three major changes. First, a direct path from Conscientiousness to Procrastination was still required (in addition to the indirect path through perseverance), suggesting that impulsivity in all its facets could not explain the entire relation between both variables. Second, additional paths were required from some general traits to some impulsivity variables. Specifically, next to Conscientiousness, Extraversion also increased Perseverance and decreased Premeditation. In addition to Premeditation and Conscientiousness, Perseverance seemed to influence Urgency to some extent. Finally, Openness affected Sensation seeking.

The final adaptation that was required to our original model was a finer-grained structure within the impulsivity scales. Interestingly, Perseverance seemed to precede the others and to uniquely influence Premeditation and Urgency (the latter negatively). In its turn, Premeditation negatively influenced Sensation seeking. The model with these paths reversed or with paths in both directions fitted more poorly than the proposed one. Figure 1 presents the final fitting model (AGFI=0.94,  $\chi^2(DF = 14) = 12.25, p = 0.59$ ). Remark that we also explored the influence of all possible two-way interactions on Procrastination by means of a hierarchical regression. None of these substantially contributed to Procrastination, while the main effects just mentioned were maintained.

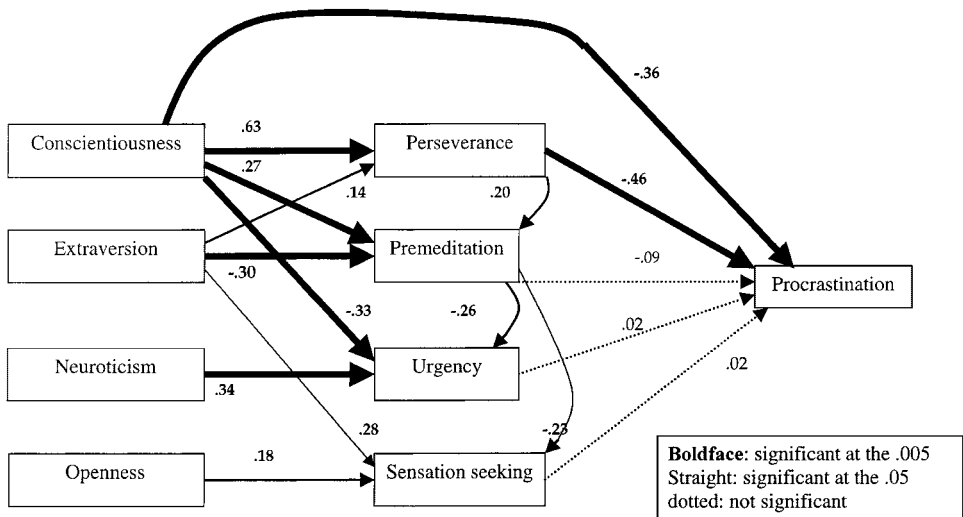


Figure 1. The antecedents of procrastination: the fitting linear equation model (phase 1).



*Procrastination and course perception*

Correlations between course perception variables and trait procrastination were not significant, with the exception of weak correlations with level of aspiration ( $r = -0.17$ ,  $p < 0.04$ ) and with importance of succeeding ( $r = -0.22$ ,  $p < 0.01$ ). Aspiration level was further related to Emotional Stability ( $r = 0.17$ ,  $p < 0.04$ ), and Perseverance ( $r = 0.26$ ,  $p < 0.005$ ). Importance of succeeding was related to Conscientiousness ( $r = 0.20$ ,  $p < 0.03$ ) and to Perseverance ( $r = 0.18$ ,  $p < 0.03$ ).

**Discussion**

In the first phase of this study, we tested the hypothesis that the relation between the higher order trait (or domain) Conscientiousness and the lower order trait procrastination is mediated by aspects of impulsivity. Specifically, we had expected that Perseverance, Premeditation, Urgency, and Sensation Seeking would all uniquely contribute to the variance in trait procrastination and explain its relation with Conscientiousness and, if any, with Neuroticism.

The correlations between procrastination and impulsivity (Perseverance, Urgency, and Premeditation) (but not Sensation seeking) are indeed significant. However, the results of the path analysis suggest that the relation between Premeditation and Urgency on the one hand and procrastination on the other is not a direct one. Rather, these relations depend on a common third variable. The weights of the paths suggest that this common sources of variability are Conscientiousness and to a lesser extent Perseverance. In contrast, Perseverance can explain a substantial part (the weights suggest more than half) of the correlation between Conscientiousness and Procrastination.

This finding is far from trivial (e.g. due to item overlap), as the items measuring Perseverance are conceptually different from those measuring trait procrastination. In agreement with Lay's (1986) definition of procrastination as a personality trait, the items in his scale reflect a problem that is situated in the enactment of one's intentions (see also Steel et al., 2001). The focus is on initiating behaviours that are required to reach one's goals. Indeed, trait procrastination had a close to nil correlation with number of intended study hours (see also Dewitte & Lens, 2000a) and was related to perfectionism, suggesting that these people had high levels of motivation (Ferrari, 1992b).

In contrast, Perseverance reflects persisting on activities that lead to one's goals. Initiating behaviour and persistence are different things. Conceptually, procrastinators might have been people who usually fail at beginning their tasks in time, but once started, finish them with zeal (see e.g. Ferrari, 1993). According to this view, they would be people with a large degree of 'inertia': starting is difficult but stopping is difficult too (compare with a heavy train that you want to push: it is hard to move it, but when it is in motion, it is difficult to stop it). In contrast, people who have difficulties sticking to an activity in the face of temptations (i.e. low in Perseverance) may well be underperformers but not necessarily procrastinators. That is, they may initiate as many of their intentions as others, but fail at their completion. In contrast with this hypothetical relation, the present findings strongly suggest that procrastination is a problem that is mainly situated in the completion of projects, rather than in or in addition to the mere initiation of behaviours leading to one's goals. Using the same metaphor, procrastinators are like people with poor physical strength: they not only have problems in getting the train in motion, but they also seem to have problems in keeping it rolling. This interpretation also suggests that procrastination may reflect a lack of facilitation (of less attractive activities, such as studying statistics)

rather than a lack of inhibition (of temptations), which is consistent with the findings of Schouwenburg and Groenewoud (2001). That is, if inhibiting temptations were the procrastinator's major problem, Urgency should have contributed more strongly to procrastination than it does here. The correlation that we found between Urgency and procrastination relies more on the relation between Urgency and Conscientiousness than on a direct causal effect. Similarly, the relation between thinking about the future consequences of one's behaviour (Premeditation) and trait procrastination was not direct, as we had hypothesized, but was also mainly mediated by variance in Conscientiousness and/or Perseverance items.

The purpose of the second phase of the study was to evaluate these findings by means of a different methodology. The focus was on behaviour rather than self-report measures. Self-reported procrastination and actual dilatory behaviour are not perfectly related (see e.g. Schouwenburg, 1994; Steel et al., 2001). Moreover, the data of the second part focus on the evolution of behavioural and perceptual measures across time rather than on a snapshot taken at an arbitrary moment during the semester. That the moment in the semester plays a role for state measures such as the expected impact was clearly demonstrated by Steel et al. (2001). They found that the intention–action gap is initially larger for procrastinators than for the punctual, but that this difference reverses in the week before the exam.

## SECOND PHASE OF THE STUDY

The major aim of this part of the study was an evaluation of the evolution across time of procrastination and study behaviour during the semester (on a weekly basis). We expected that study efforts would intensify during the few weeks before the examinations, and that the rate of this acceleration would be larger for procrastinators than for the punctual (see Schouwenburg & Groenewoud, 2001). They did not find a similar difference between procrastinators and their counterparts in the evolution of either general study motivation, or resistance to (social) temptations. However, in the introduction we reasoned that people might have difficulties predicting their reactions to imagined temptations. The present method removed this ambiguity by asking them not to predict but to report their resistance to temptations.

In addition, two crucial variables were measured on a weekly basis to evaluate their role in dilatory behaviour in general, and study behaviour in particular. The first variable was the impact students thought that studying the coming week would have on their final results. Second, we measured the reasons why they had failed to enact their intentions (if applicable). If procrastination is characterized by a higher vulnerability to temptations, postponement should be due to fun alternatives rather than to fatigue, external reasons, change of study plans, or other factors. If procrastinators lack facilitation, the larger discrepancy between their intentions and behaviour should be due to a lower perceived impact of studying.

## Method

### *Participants*

Fifty-four participants volunteered to cooperate in the follow-up study by providing their e-mail addresses in the first phase. Men were somewhat more likely to comply (9/17, 52.9%) than women (45/130, 34.6%). Of these 54 participants, 23 persisted until the end.

Two of these students did not study in last week because of (self-declared) test anxiety. We provided them with the coordinates of the local student counselling service. Complete measures of 21 students were therefore taken into account.

Further, we explored whether compliers differed on any relevant dimension from non-compliers. It should be kept in mind that compliance not only depended on participants' willingness to participate, but also on their having an e-mail that they checked regularly (see 'Method' phase 1). The grades the different groups of students obtained cannot be used to evaluate possible sample differences because of the confound between method and sample.

Four differences between the two groups were significant and one marginally significant. In comparison with non-compliers, compliers had higher scores on Sensation seeking ( $M = 2.79$  versus  $M = 2.59$ ,  $SD = 0.6$ ;  $F(1, 145) = 4.02$ ,  $p < 0.05$ ), (marginally) on Extraversion ( $M = 3.62$  versus  $M = 3.40$ ,  $SD = 0.7$ ;  $F(1, 145) = 3.62$ ,  $p = 0.06$ ), on Openness ( $M = 3.87$  versus  $M = 3.63$ ,  $SD = 0.7$ ;  $F(1, 145) = 4.30$ ,  $p < 0.04$ ), lower scores on Premeditation ( $M = 2.76$  versus  $M = 2.92$ ,  $SD = 0.4$ ;  $F(1, 145) = 6.52$ ,  $p < 0.02$ ). All other  $F$  values were smaller than 1.0. In sum, the differences were small and the crucial variables (Procrastination and Conscientiousness) did not differ at all.

Of the 54 compliers, several students did not make it to the end. Two e-mail addresses did not work. Ten students did not answer the first e-mail. During the second phase 19 students stopped (of which 13 announced and apologized). Finally, two were discarded from analyses because of test anxiety (see above).

### *Procedure*

Participants received an e-mail every Monday (the same day as the first session). They were asked the number of hours they intended to study until (and including) next Monday for statistics (question 1), and how many hours they had actually studied since last Monday (question 2). The lectures for this course had finished by the first session. Most participants answered within the first 24 hours, with an average delay of 20 hours over participants over measurements).

In the third question, they had to subtract the hours actually studied from the hours planned last week (which was rehearsed for them). If this difference was larger than zero, they had to assign these hours to one or more of the five following categories: (i) fatigue, (ii) more fun alternatives (friends, sports, T.V., surfing, etc.), (iii) external causes (visit, pressure of others, fire), (iv) change in study plans (studying another course), and (v) other reasons, in which case they were asked to specify. Finally, they had to estimate the impact on their final grade of studying 5 hours the coming week in comparison with no studying at all (see Method, study 1).

In the system the participating students were enrolled in, most exams were clustered in one month (June). The exam for statistics took place 11 weeks after the first session. Thus, 11 measurements were taken (ten intentions, ten impacts, ten behaviours, ten intention-behaviour differences, with intentions measured one week before the behaviours).

## **Results**

### *Relations between trait measures and intentions, behaviours, and perceptions averaged over measurements*

We created a measure for dilatory behaviour by dividing the number of hours studied by the number of hours intended for every week and every participant (unless they had no intentions for that course the previous week), and subtracting this from unity (which

Table 2. Correlations between trait measures and average study intentions and behaviours, dilatory behaviour, perceived impact of studying (phase 2)

	Cons. <sup>1</sup>	Extr.	Neur.–	Openn.	Pers.	Prem.	Urg.	Sens.	Proc.
Intended study hours	–0.22	0.32	–0.27	–0.20	–0.52*	0.07	0.13	–0.17	0.50*
Hours studied	–0.24	0.15	–0.09	0.12	–0.47*	0.08	–0.02	0.07	0.35
Dilatory behaviour	–0.04	0.04	–0.13	–0.21	–0.11	–0.02	0.21	–0.26	0.12
Due to									
Fatigue	–0.32	–0.09	<b>–0.56</b>	–0.10	–0.31	0.23	0.29	–0.36°	0.39°
Fun alternatives	–0.18	0.11	–0.06	–0.32	–0.31	0.27	0.39°	–0.12	<b>0.57</b>
External reasons	0.07	0.09	–0.15	0.02	–0.25	0.15	–0.21	0.03	0.01
Change in plans	–0.15	–0.41°	–0.11	–0.15	–0.28	0.06	0.05	–0.33	0.24
Impact of studying	0.30	0.25	0.38°	0.28	0.30	0.34	0.08	0.53*	–0.12

Boldface  $p < 0.01$ ; \* $p < 0.05$ ; ° $p < 0.10$ .

<sup>1</sup>Cons., Conscientiousness; Extr., Extraversion; Neur.–, Neuroticism (reversed); Openn., Openness; Pers., Perseverance; Prem., Premeditation; Urg., Urgency; Sens., Sensation seeking; Proc., Procrastination.

denotes complete intention fulfillment). These were then averaged across measurements. For instance a value of 0.2 refers to the fact that a student actually enacted on average 80% of his or her study intentions and failed to do so for the remaining intentions. Further, the number of hours postponed was categorized according to a reason they selected from the five categories mentioned above. Participants could choose between fatigue, fun alternatives, external reasons, and changes of study plans. The fifth category was diverse (e.g. illness, test anxiety, finished earlier than anticipated, etc.) and was discarded from analyses.

Table 2 shows the intercorrelations between the trait measures (collected in phase 1) and the averaged repeated measures. The expectations were that procrastination would be positively related to dilatory behaviour and to the relative frequency of postponement due to fun alternatives (but not other reasons) and negatively to low perceived impact of studying; no relation was expected with number of intended study hours. A similar pattern of relations was expected with Urgency, and an opposite pattern for Conscientiousness, for Perseverance, and for Premeditation. Note that the statistical power of these tests is quite low due to the small sample sizes.

Contrary to expectations, students relatively high in trait procrastination intended to study *more* hours and also, although not significantly, did study more hours than students relatively low in this trait. Dilatory behaviour, defined as intention–behaviour discrepancy, was not related to procrastination or to lack of conscientiousness or to any of the impulsivity subscales. Thus, at least in studying statistics, trait procrastination resulted not in dilatory behaviour, but in increased effort in this sample.

However, focusing on a specific form of dilatory behaviour (postponement because of fun alternatives) changed the picture. The relation with procrastination was high and reliable, whereas that with Urgency was smaller and not significant. It seems, then, that procrastination is related to the failure to ward off temptations, and less to other varieties of dilatory behaviour.

Further, no reliable relations with impact of studying (averaged over measurements) were found, except (unexpectedly) with Sensation seeking and, to a lesser and not significant extent, with Emotional stability. Sensation seeking apparently increased perceived impact of studying. To our surprise, number of intended study hours tended to be positively related to procrastination and negatively to Perseverance. Finally, postponing

study intentions because of fatigue seemed positively related to neuroticism (and not to extraversion, although this domain incorporates the facet 'activity').

*Hyperbolic discounting of study intentions and behaviour: group data*

The ten measurements of the intended and studied hours were averaged over participants (yielding two series of ten measurements). The delay was converted to days, and the number of hours intended and studied was divided by seven (i.e. hours a day). The maximum hours studied was set at 40 hours a week (which was derived from the observed maximum number of hours intended). In order to find the best fitting hyperbolic curve (and corresponding  $k$ —see Schouwenburg & Groenewoud, 2001) the sum of squared discrepancies between observed and predicted values (over the ten measurements) was minimized. For comparison, the best fitting linear trend was computed.

Figure 2 shows the best fitting hyperbolic curves, linear trends, and observed trends for number of intended hours. With respect to intentions, the hyperbolic curve explained 89.2% of the variance in the data, with a  $k$  of 0.44. (Larger  $k$ -values reflect steeper curves). The best fitting linear trend explained only 47.6% of the variance in the data. It can be observed that intentions in weeks 2 and 3 are somewhat lower than predicted. This is probably due to other examinations in that period. The substantial low in week 9 is a result of the clustering of the examinations (see above). Three weeks before the series of exams begins, all lectures cease, which allows students to prepare for the exams. Because the series of exams is the same for all students, the ninth week is typically reserved for preparing for exams that follow later in the series, which explains the low in the study intentions during that week. In spite of these specific characteristics of the examination system the present students were involved in, the hyperbolic curve still fits reasonably well.

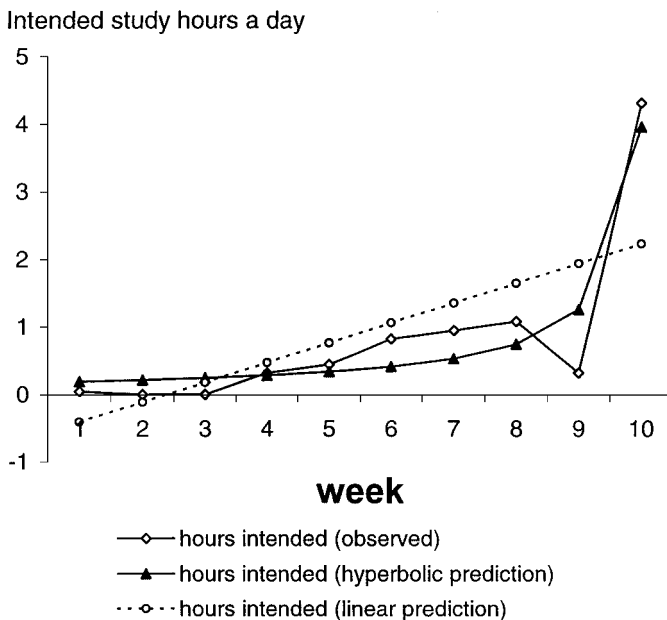


Figure 2. The evolution of study intentions over a 10 week time interval and the best fitting hyperbolic and linear curves (phase 2).

Table 3. Correlations between the individual  $k$ -parameters for intentions and studying, and conscientiousness, perseverance, premeditation, and procrastination ( $n = 21$ ) (phase 2)

$k$ -parameter	Conscientious.	Persever.	Premedit.	Procrastination	Hours
$k$ for study intentions	0.28	0.34	0.31	-0.35	-0.81***
$k$ for study hours	0.41*	0.44**	0.40*	-0.34	-0.77***

\* $p < 0.08$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.0001$ .

For number of hours studied, the curve is highly similar to that presented in Figure 2 (see correlations between intentions and behaviour, Table 4). Here, the fit is 91.9% (linear trend 49.1%), with a  $k$  of 0.46.

#### *Hyperbolic discounting of study intentions and behaviour: individual data*

Two  $k$ -values were calculated for each individual: one for study intentions and one for actual study behaviour with the same estimation technique. The correlations between these  $k$ -values and the traits were calculated. It was expected that procrastination, lack of conscientiousness, and lack of perseverance would be positively related to the  $k$ -values of study behaviour, but not that of intentions. Table 3 shows the correlations between the two  $k$ -values and the three variables just mentioned and premeditation. Unexpectedly, the trend was opposite to the trend predicted: Conscientiousness, lack of Procrastination, Perseverance, and Premeditation were all related to larger  $k$ -values (i.e., steeper curves, referring to later studying).

The last column of Table 3 shows the correlations between the  $k$ -values and the corresponding behaviour. These correlations show that  $k$  is highly determined by the number of hours intended or studied: the more one studied or intended to study during the entire time interval, the lower was the  $k$  for studying.

To rule out that technical features of the estimation procedure might have yielded artificial results, the individuals' curves were inspected. Figure 3 presents the highest and lowest scorers on procrastination. The high scorer (average of 4.40 on a five-point scale) had the second lowest  $k$ -value (0.28) of the sample, and studied much more and earlier than the low scorer (average of 2.20), who had the highest  $k$ -value of the sample (1.17). Given that intentions largely determine behaviours in the present sample (see below, Table 4), and that procrastinators are more likely to postpone their intentions (see Table 2),

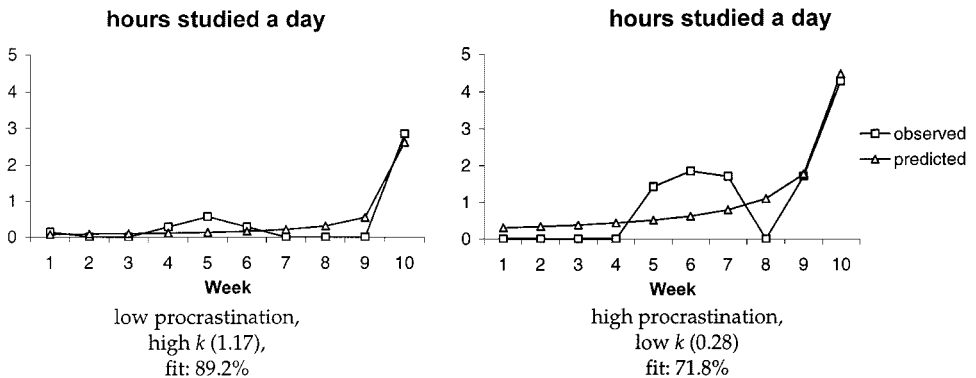


Figure 3. The evolution of study behaviours for two extreme individuals on the procrastination dimension over a 10 week time interval (phase 2).

Table 4. Correlations between intentions, behaviour, and perceptions over time measurements ( $n = 10$ ) (phase 2)

	Lag	1	2	3	4
1. Hours intended	0				
2. Hours studied	1	<b>0.997</b>			
3. Dilatory behaviour	1	-0.14	-0.20		
4. Dil. beh. due to fun alternatives	1	-0.05	-0.09	<b>0.83</b>	
5. Perceived impact of studying	0	<b>0.84/0.73<sup>o</sup></b>	<b>0.87</b>	0.33	-0.10

Bold  $p < 0.01$ ; <sup>o</sup>second correlation: number of week partialled out.

this seems to suggest that procrastinators tend to compensate their tendency by intending to study more and earlier. Apparently, the compensation in intentions outweighed the postponements in the present sample, yielding a negative relation between procrastination and  $k$ -values for studying behaviour.

#### *Relations between intentions, behaviours, and perceptions across the measurement period over individuals*

Earlier, we reported that perceived impact of studying averaged over measurements was not related to the traits measured (except Sensation seeking), study behaviour, or dilatory behaviour over individuals. Now we shall explore whether there is a relation between impact and other weekly measured variables over individuals. Table 4 shows the interrelations between intentions, perceived impact, behaviour (with a lag of one week), dilatory behaviour, and the major source of postponing: (vulnerability to) fun alternatives (divided by intentions averaged over participants). To rule out the possibility that impact and intention are correlated merely because they are related with delay, the number of the week (i.e. the delay to the exams) was controlled for. The partial correlation is presented as the second correlation in the relevant cell in Table 4.

The data indicate that study intentions determine study behaviour almost perfectly (measured one week later) in the present sample. Dilatory behaviour is not related to any of the other variables, but is highly related to postponement due to fun alternatives. Further, perceived impact is strongly related to intentions. This is surprising because the variability in perceived impact is quite low in comparison with that of number of intended study hours. Table 5 shows the evolution of the perceived impact of studying and number of intended hours over the 10 week period. The bottom line shows the correlation between number of week and the two measures.

## Discussion

First, the data show that study intentions and behaviour follow an evolution across time that can be characterized as a hyperbolic function: low study activity at the beginning that is continued for a long time, and a steep increase close to the exams. Schouwenburg and Groenewoud (2001) have already noted that this general 'cramming' trend is normal: most people behave this way, irrespective of their trait procrastination. This is in line with Logue's (1988) account of self-control: people are able to look into the future, but the influence of the future is relatively limited. One could argue that this is functional. Studying intensively ten weeks before the exam might be lost effort, not only because of highly unlikely events that might intervene and prevent the efforts from yielding the anticipated rewards (see Logue, 1988), but perhaps mostly because of forgetting. Indeed,

Table 5. Evolution of intentions and perceived impact of studying five hours a week over the 10 week time interval (phase 2)

	Perceived impact (points on 20)	Intentions (hours a day)
Week 1	0.83	0.32
Week 2	0.70	0
Week 3	0.82	0
Week 4	0.72	2.24
Week 5	0.83	3.09
Week 6	0.75	5.77
Week 7	0.80	6.64
Week 8	0.80	7.57
Week 9	0.88	2.24
Week 10	1.10	30.18
Correlation with time	0.62 ( $p = 0.066$ )	0.69 ( $p = 0.03$ )

students seem to appreciate that the impact of their efforts increases when the delay to the exams decreases, although the absolute difference is smaller than what could be expected intuitively (i.e. the increase is very modest in comparison with the increase in intentions; see Table 5).

Nevertheless, the correlation between perceived impact and number of intended hours is quite substantive. The present data do not allow firm causal inferences, but delay until the exams might be considered to determine both. However, this relationship remains high when number of the week is partialled out. This suggests that delay *per se* does not determine both intentions and perceived impact separately, but that one determines the other. Further research is called for to explore whether perceived impact determines intentions or vice versa.

Schouwenburg and Groenewoud (2001) found that the *k*-value (i.e. degree of acceleration of studying) is related to procrastination. They reported that procrastinators had higher *k*-values than the punctual. Specifically, the delay at which they imagined beginning to study fell closer to the exam for procrastinators than for others. In the present study, we were not able to replicate this finding. As Figure 3 shows, procrastinators neither intended to study less nor actually studied fewer hours than others, nor did they exclusively cram at the last moment: on the contrary. Still, procrastination was related to dilatory behaviour, at least to postponing behaviour due to fun alternatives.

How could these diverging findings be reconciled? It seems as if procrastinators (i.e. people who postpone a larger proportion of their intentions than others) are aware that they are more vulnerable to lurking temptations and therefore try to compensate for this weakness by formulating more intentions. This compensation may be preventive, curative, or both. The curative interpretation might explain why procrastinators had higher *k*-values when imaginative data were used (Schouwenburg & Groenewoud, 2001), whereas they did not when retrospective data were used. Specifically, one cannot cure what has not happened. However, the curative interpretation would also imply a correlation between intentions and postponements the week before (in general or due to fun alternatives), but no evidence was found for this correlation in the present study. However, the number of observations is extremely small ( $n = 8$ ) and the lack of correlation might be unreliable.

In addition, vulnerability to temptations may be subtler than our measures could convey. Possibly procrastinators have problems concentrating *during* their study activities (Dewitte & Lens, 2000b; Harriott & Ferrari, 1996), although they may sit in front of



their books and be studying objectively. Consistent with this interpretation is the finding that people high on perseverance (which is highly negatively correlated with procrastination, see phase 1) formulated fewer intentions. Possibly they were confident that when they studied, they would do so efficiently. The punctual indeed tended (but not significantly so) to perceive the impact of studying for five hours as higher than procrastinators did. This rather supports the preventive interpretation: Procrastinators intend more because they know that their studying is not so efficient.

In sum, procrastinators reveal themselves here as highly motivated students. However, they suffer from a serious problem: while studying, they are vulnerable to temptations. We found that they indeed have more troubles acting upon their intentions, and that this is mainly due to their indulgence in more fun activities. However, our data suggest that this does not necessarily lead them to complete failure. They seem to compensate this weakness by increasing their good intentions. They may do so not only because they expect that unanticipated temptations will pull them from their books, but also because they might have trouble concentrating in general. In other words, one hour of study might not be the same for them as for punctual students.

We want to stress that we selected study behaviour for convenience reasons. Students are the best accessible population and happen to share study intentions. This does not mean that the second phase of the study is only relevant for academic procrastination, although we acknowledge that the study should be replicated using other situations.

## GENERAL DISCUSSION

The major aim of this study was to increase our understanding of procrastination. We wanted to explore whether it was related to impulsivity (Ferrari, 1993), as claimed by self-control literature, and if so, to which aspects of impulsivity. We tackled this question with two different methodologies. We first explored whether trait procrastination was related to various aspects of impulsivity, which might explain the relation between conscientiousness and procrastination, and then proceeded with investigating its relation with study behaviour and perceptions and how these variables evolved during the semester.

The present study provides multiple evidence that trait procrastination is related to impulsivity. First, lack of perseverance or the difficulty a person experiences maintaining goal-driven behaviour explained a large part of the variance in procrastination items. Still, a portion of variance in trait procrastination remained directly related to an aspect of conscientiousness that was not captured by impulsivity scales. It is difficult to speculate on this, because many documented correlates of procrastination seem to be captured by one or more of the impulsivity scales. For instance, negative affect and its ensuing urge to relieve bad moods (Tice et al., 2001) would be captured by Urgency. Perceiving long-term goals and the resulting increase in motivation (see e.g. Dewitte & Lens, 2000a; Metcalfe & Mischel, 1999) would be captured by Premeditation. Two other candidate correlates are lack of perfectionism and rebelliousness (Lay, 1986, 1990), which might be related to both lack of conscientiousness and procrastination, but not to the impulsiveness scales. Nevertheless, one could argue that Premeditation might be related to both constructs and hence also explain that relation. More research is needed to settle this issue. Moreover, 39% of the variance in procrastination items remained not explained at all (note that this is in an overestimation because it includes scale unreliability). Further, the expected bivariate correlations between Urgency and Premeditation on the one hand and procrastination on

the other seemed to rely entirely on the mutual relations with Conscientiousness and/or Perseverance.

In sum, procrastination and impulsivity (especially lack of perseverance) are closely intertwined and their relation partially explains the relation between procrastination and conscientiousness. However, the remaining common variance in conscientiousness and procrastination remains obscure, as does the remaining variance in trait procrastination. Taken together, the first phase of this study suggests that procrastination is related to a lack of facilitation, because perseverance was the only aspect of impulsivity to uniquely determine procrastination.

In the second phase, procrastination also turned out to be related to higher impulsivity. Specifically, procrastination was only slightly related to a larger behaviour–intention gap (which it should be according to the Lay (1986) definition, see also Steel et al., 2001) but it turned out that the major source of delay was vulnerability to fun alternatives (rather than to fatigue, external reasons, or changing study plans). Procrastinators mentioned much more frequently that they did not succeed in attaining their planned number of hours because of fun alternatives than did more punctual students. Further, procrastination was not related to a higher perceived impact of studying. Therefore, the second phase of this study suggests that procrastination reflects a lack of inhibition rather than a lack of facilitation.

At first sight, then, both methodologies lead to conflicting conclusions. The first phase supports the lack of facilitation interpretation of procrastination (i.e. procrastinators do not persist on their activities), whereas the second phase supports the lack of inhibition option (i.e. procrastinators cannot ward off temptations). However, the second phase revealed that lack of Perseverance strongly determined vulnerability to fun alternatives, even more than did Urgency (see Table 2). This suggests that either Perseverance reflects a lack of inhibition rather than a lack of facilitation or that lack of inhibition and lack of facilitation are not so divergent as we first thought they were (see e.g. Whiteside & Lynam, 2001). Because of the well documented difference between the two drives in human behaviour (see e.g. Gray, 1987; see also below), we favour the first option: maybe low Perseverance reflects a lack of concentration relying on a lack of inhibition, rather than a lack of facilitation (we also refer to the significant negative correlation between Urgency and Perseverance: see Table 1). Our tentative conclusion then is that procrastinators are people who are vulnerable to distractions in general but do not have problems in facilitating their behaviour. From this perspective, the poorer relation between procrastination and Urgency in the first study suggests that relieving negative moods by behaving impulsively (i.e. Urgency) is less typical of procrastinators than a weakness in warding off more mundane temptations while working (Perseverance). The divergence with Schouwenburg and Groenewoud (2001) might then be related to people's inability to predict their reactions to unanticipated temptations. Moreover, distractibility has been shown to be related to (decisional) procrastination, which is in line with the present interpretation (Harriott & Ferrari, 1996).

How do procrastinators deal with this vulnerability to fun alternatives? The present study (phase 2) provides a new perspective on the problem. Our data suggest that procrastinators try to compensate for their vulnerability by setting more intentions for themselves. This difference was not evident at the beginning of the semester, but procrastinators seemed to overtake more punctual students in formulating intentions. This provides additional evidence that procrastination does not reflect a lack of facilitation. It seems that this strategy is quite effective in enhancing their study efforts (expressed in hours studied and in the *k*-parameter), in spite of their larger vulnerability to temptations.

To conclude, therefore, procrastinators seem to suffer from strong temptations in the present, and not from weak incentives in the future, which is in line with the conclusion Ferrari and Emmons (1995) reached using a different methodology.

One additional finding deserves comment. We did not find evidence that perceived impact of studying affected dilatory behaviour. In the first place, this is an additional indication that procrastination does not reflect a lack of facilitation. Still, perceived impact showed a substantial (and unanticipated) relation with number of intentions formulated (and hence with study behaviour during the following week). This suggests that awareness of future incentives helps people to engage in the required activities. It should be noted, however, that it is also possible that a large perceived impact is a *post hoc* attribution of more intended effort. Moreover, the relation between perceived impact and intentions was only revealed when we considered intraindividual rather than interindividual differences. Probably, this is due to the relative difficulty of the item tapping perceived impact. People may have their personal standard but not be able to give a more objective estimation.

This study suffers from some limitations, which also suggest some future research options. First, the conclusions may be limited by the fact that the sample consisted largely of female freshmen of one particular department, that the measurements were limited to study intentions and behaviour for one particular course, and that the education system (especially its clustering of exams) is not representative of the educational systems that are common worldwide. Moreover, it is conceivable that many perceptions that were measured in the first study strongly fluctuate during the first year of experience with the academic world. Procrastination scores may change as a result of self-perceived behaviours during the first year of the academic career. Therefore, we call for a replication of the present study in another educational system with a more balanced gender distribution, with other courses, and with older students.

Further, the sample size of the second phase is too small to draw firm conclusions. Further, although phase 1 and phase 2 participants did not seem to differ on the important trait measures, the sample remains highly self-selected. This might affect the findings. It is conceivable that the remarkable finding that procrastinators formulate more study intentions than the punctual only applies to motivated procrastinators, and not to unmotivated procrastinators. In our sample, motivated procrastinators might have been over-represented, because the unmotivated dropped out earlier in the study. Future research might benefit from differentiating motivated from unmotivated procrastinators.

Moreover, to enhance the reliability of the intra-individual correlations and the *k*-parameters, finer-grained measures (for instance once every three days) may be useful. For instance, the method did not allow us to deal with the behaviours during the last week before the exams. Possibly, the largest differences between procrastinators and the punctual occur during that period (e.g. Steel et al., 2001). However, the present study provides a first step toward (easily applied) dynamic rather than static data collection methods in this area. We strongly believe that this method may reveal much interesting information that remains obscure when only static measures are taken. Still, it is not as practically prohibitive as for example event sampling methods.

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