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Department of Psychology

Student procrastination:
Measurement, reduction and Environmental factors

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Kent Nordby

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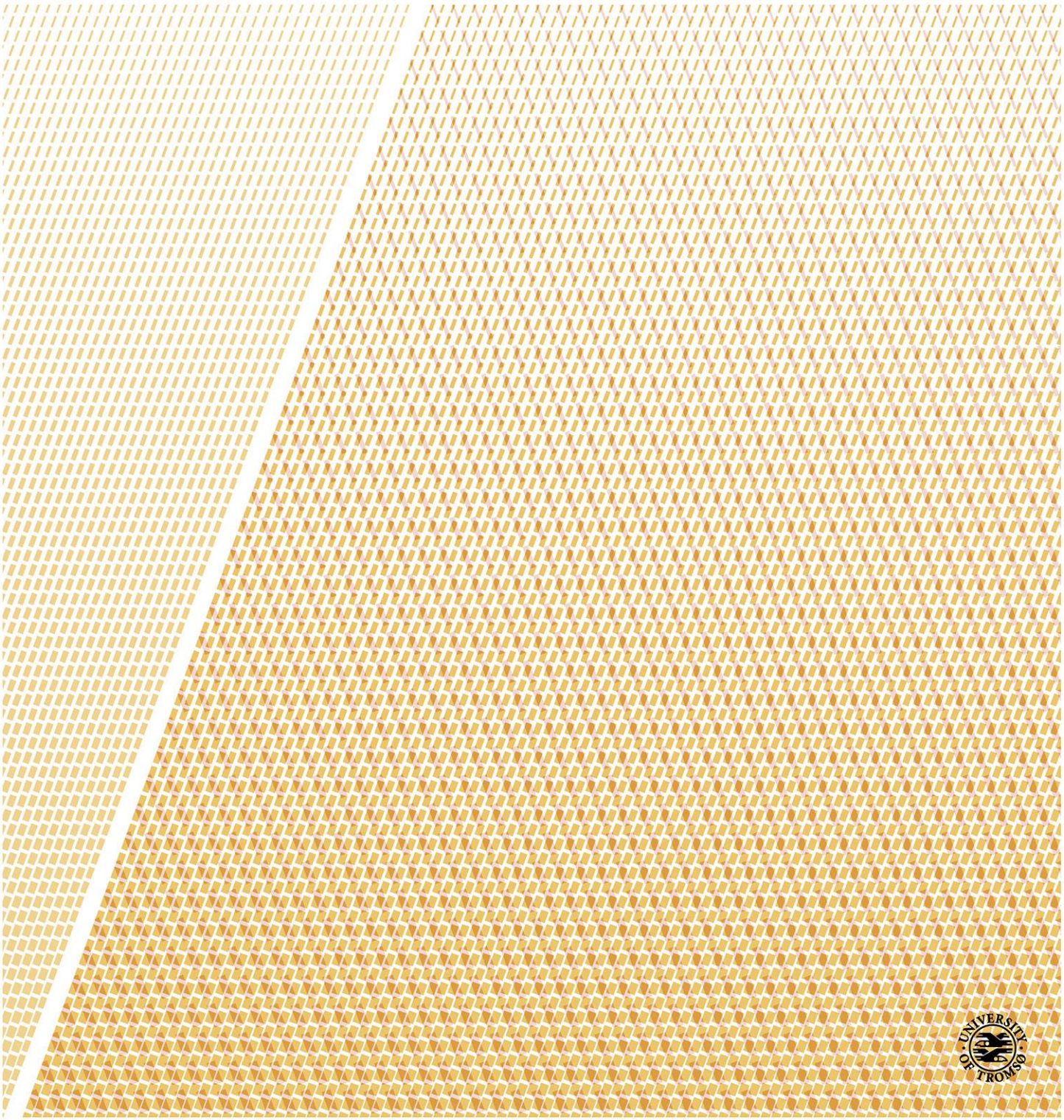

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Abstract

The procrastination problem affects half or more of all students, negatively affecting health, well-being, and performance. The present thesis focuses on three facets of this problem. In three papers, we examine important research questions: First, an important issue in procrastination research is the need for validation of translated instruments. In our first study, we examine two procrastination instruments, the Irrational Procrastination Scale and the Pure Procrastination Scale (Steel, 2010), finding that both instruments are valid measures for use in different European cultures. The second paper examines a group intervention to reduce academic procrastination. We administered a brief program to inform students about procrastination and to teach remedies to reduce unnecessary delay. Results showed a significant reduction in procrastination from pre- to post-test, students high in procrastination demonstrating the most positive change. Finally, while we know much about endogenous factors, little is known about exogenous, environmental factors affecting procrastination. Addressing this, Study 3 investigated how the academic environment may foster academic procrastination, demonstrating that the academic environment sometimes appears "procrastination friendly". Overall, the current research contributes to the field in three different but still related domains, and demonstrates that environmental factors may be particularly important for future research to address.

Keywords: Procrastination; academic procrastination; measurement; intervention

Introduction

The word "procrastination" stems from the two Latin words *pro*, meaning "forward, forth, or in favor of" and *crastinus*, meaning "of tomorrow" and refers to the delay of intended tasks despite expecting to be worse off because of the delay (Steel, 2007). These delays can go from being relatively harmless, like postponing the laundry or doing the dishes, to delaying more serious matters, like failing to pay bills on time, or waiting to seek necessary healthcare. Most people delay both important and unimportant tasks occasionally, but when delay becomes a frequent and regular habit, procrastination becomes more than just an inconvenience. For some, the delay of important tasks can result in serious consequences, such as losing one's job due to inability to meet obligations on time. In the academic arena, procrastination occurs when students delay tasks such as exam preparations, writing term papers, and keeping up with weekly assignments (i.e., academic procrastination). An aggravating aspect of procrastination is the irrational nature of the phenomenon: tasks are being delayed even though ones better judgement tells one ought to not to (Neenan, 2008). Procrastination remains a common phenomenon that almost a fifth of the general population (Steel & Ferrari, 2013) and half or more of the student population (Ellis & Knaus, 1977, cited in Steel, 2007) struggle with, resulting in large costs on an individual, relational, and societal level (Steel & Ferrari, 2013).

Research on procrastination has seen a sharp upswing in interest over the last decades, leading to a variety of approaches to understanding, measuring, and researching it (Klingsieck, 2013). The bulk of these investigations has been correlational, demonstrating how procrastination is related to increased stress, anxiety, and depression, as well as reduced physical and general well-being (Rozental & Carlbring, 2014; Steel, 2007). Efforts towards reducing procrastination, particularly among students, have shown promising results using

techniques such as cognitive behavior therapy, goal setting and time management, among others (Rozental et al., 2018; van Eerde & Klingsieck, 2018). However, even though our understanding of procrastination has grown considerably, there is still much to learn about why people irrationally delay, and how help reduce the problem.

The purpose of the current thesis it to contribute to the procrastination literature in three important areas. First, the validation of instruments in psychological research is an important and necessary process to ensure that instruments measure the constructs of interest. In procrastination research, most instruments are developed in English speaking countries, and few instruments have been validated outside their country of origin. To help fill this gap, the first study examines two procrastination instruments, the Irrational Procrastination Scale and the Pure Procrastination Scale (Steel, 2010) for use in research in Norway (including our own research) as well as five other European countries. Second, while it is clear that many students struggle with procrastination, research on procrastination interventions remain relatively scarce (Wäschle et al., 2014). This may be a result of interventions often being complicated, time-consuming, and costly to execute. Interventions that can be applied to large groups of students simultaneously might therefore be a cost-efficient way to help those who struggle. Consequently, in the second study, we investigate if applying a lecture-based intervention to a large group of students simultaneously can help reduce academic procrastination. Finally, while endogenous factors have been extensively investigated in procrastination research, exogenous factors have so far been largely neglected (Klingsieck, et al., 2013). Being a student often means being in contact with a multitude of different social and cultural (academic) environments, but little is known about the potential effects these different environments have on procrastination. Hence, in our third study, we investigate how environmental factors in different academic disciplines (medicine, natural sciences, and humanities) might influence procrastination.

The present thesis starts with a general introduction to procrastination research, followed by an examination of causes and consequences of unnecessary and unwanted delay. Then, a more in depth overview will be presented of the themes particularly relevant to the current thesis, namely, instrument validation, interventions, and environmental causes of procrastination.

1.1 Procrastination: Definition and nomological network

Procrastination refers to *delays of intended tasks despite the person expecting to be worse off because of the delay* (Steel, 2007). This definition emphasizes that the delay is of intended behavior (i.e., a decision to reach a goal), and that the person is aware of negative consequences when delaying. For example, a student delaying writing on a term paper or reading syllabus for an upcoming lecture is procrastinating if the delay is intentional and the student realizes that she will be worse off because of the delay ("I delay reading even if I shouldn't, and not reading will make tomorrows lecture hard to understand"). Importantly, an individual will often delay planned actions for good reasons (e.g., change one's mind, change priorities, realize that a task actually requires more time). Hence, procrastination refers to those forms of delay where the individual does *not* have good reasons for the delay (Klingsieck, 2013; Steel, 2010). Thus, procrastination refers to irrational delays – delays that are illogical and do not have good reasons, engaging in behavior that they are aware of is acting against their long-term interests. Accordingly, procrastination has been referred to as the quintessence of a self-regulatory failure (Steel, 2007). Lastly, while most of us engage in procrastination sporadically, problematic procrastination occurs when dallying has turned into a regular habit.

Research (van Eerde, 2003) has discussed whether procrastination can be regarded as construct independent from similar concepts relating to personality variables, motives, affect,

and performance. For example, the correlation between the Big 5 Conscientiousness trait and procrastination is -.63 (van Eerde, 2003), suggesting that these constructs (despite being opposite) may be difficult to distinguish from each other. However, as discussed by Steel (2007, p. 67), conscientiousness must be regarded as a broader construct. Procrastination may be a central facet of conscientiousness, but it is not conscientiousness itself. As is seen in Table 1 (p. 55), procrastination relates to other personality variables in predictable ways. For example, in addition to a strong negative correlation with Conscientiousness, procrastination correlates positively with self-handicapping (r = .46) and impulsivity (r = .41), and negatively with self-efficacy (r = -.38) and self-control (r = -.58), leaving the conclusion that procrastination is overall negative to the person. Importantly, research has determined weak or absent relations between procrastination and age, gender, and intelligence. Also noteworthy, the correlation between procrastination and perfectionism is negligible, r = .03 (Steel, 2007). Some, both popular media and researchers, have claimed that procrastination at times may be beneficial to the person (i.e., "active procrastination;" Chu & Choi, 2005), but there is little consensus about such a view (Chowdhury & Pychyl, 2018).

1.2 History and theoretical accounts

Examining the history of procrastination research provides an enhanced understanding of the procrastination construct as well as its theoretical understanding. The earliest reference to a book on procrastination is "Procrastination Through the Ages" by Paul Ringenbach, published in 1971. However, the book was never actually written. Instead, the book was a publishing-industry inside joke, the punchline being that no dawdling writer would get around to finishing a book on procrastination history (Steel, 2007). The first actual book on procrastination was a book by Ellis and Knaus, "Overcoming procrastination", and would be the first of many books on the subject (Santella, 2018). Albert Ellis applied his theories on

Rational Emotive Behavior Therapy (REBT) to approach the problem of procrastination systematically (Santella, 2018), and several of his ideas are still preserved in the treatment of procrastination today, with REBT and its progeny Cognitive Behavior Therapy (CBT) sometimes being seen as the preferred treatment to procrastination (Pychyl & Flett, 2012).

The first research articles on procrastination started appearing around the late 1960s and 70s, mainly preoccupied with students struggling with procrastination (e.g. Lum, 1960; Newman et al., 1974; Semb, Glick & Spencer, 1979). For example, Blatt and Quinn (1967) compared procrastinating and non-procrastinating students, and concluded that there was no difference between the groups on general intelligence, but that procrastinating students had less capacity for anticipation and planning. Several articles focused on interventions that could help reduce what was already then considered a concerning problem for many students (e.g. Bijou, Morris, & Parsons 1976; Ziesat, Rosenthal & White, 1978). Further, freedom in the study situation (i.e., self-pacing and lack of deadlines) and poor motivation were factors seen as important antecedents to procrastination (Born & Moore, 1978; Morris, Surber & Bijou, 1978), Towards the end of the 1970s, the first application of procrastination scales in research was also seen (Strong et al., 1979).

In the 1980s, procrastination gained popularity in the research community, spearheaded by researchers such as Joseph R. Ferrari, William G. McCown, and Clarry H. Lay. With more than 50 journal publications on the subject, procrastination was establishing itself as an independent field of research, with more systematic investigations into the causes and consequences of procrastination (Beswick, Rothblum & Mann, 1988). Research started taking a particular interest in the connection between procrastination and personality constructs (e.g., McCown, Johnson, & Petzel, 1989), finding that procrastinators had a higher tendency towards both neuroticism and impulsivity compared to non-procrastinators. Research participants were still predominantly students, but research was now also starting to

look outside the academic arena and into procrastination in everyday life (Milgram, Sroloff & Rosenbaum, 1988), as well as the workplace (Harris, & Sutton, 1983; Coote-Weymann, 1988). Intervention studies were relatively frequent compared to overall number of studies. More serious efforts were also put into the measurement of procrastination, with several new scales being developed, including the Aitken Procrastination Inventory (API; Aitken, 1982), General Procrastination Scale (GP; Lay, 1986) Adult Inventory of Procrastination (AIP; McCown, Johnson & Petzel, 1989), and the Procrastination Assessment Scale – Student (PASS; Solomon & Rothblum, 1984), some of which are still in use in procrastination research today.

The growth of empirical knowledge on procrastination was also accompanied by different theoretical explanations of the phenomenon, often based on prevailing paradigms at the time. For example, Freud believed that the avoidance of certain tasks was a consequence of anxiety functioning as a warning signal to the ego, which would institute avoidance behavior in order to protect itself (Ferrari, Johnson, and McCown, 1995). Also in the psychoanalytic tradition, Blatt and Quinlan (1967, cited in Ferrari, Johnson, and McCown, 1995), noted how their procrastinating students were more "present oriented" and produced more death themes when completing story stems. In their interpretation, chronic lateness was related to an unconscious fear of death, and procrastination was the unconscious attempt to ward off ones' mortality by defying the constraints of time. In the coming behavioristic traditions, procrastination was a result of reinforcement or lack of punishment in combination with task averseness and temporally distant rewards (Ainslie, 1975; Ferrari & Emmons, 1995). In operant conditioning, procrastination could be seen as both a negative reinforcer (not having to do an unpleasant task), as well as a positive reinforcer (doing something fun), resulting in a circle of behavior that continued until the punishment (i.e. anxiety, stress, approaching deadlines) exceeded the rewards (Ferrari, Johnson, and McCown, 1995). Strong

et al. (1979) applied social psychology and attribution theory to explain procrastination. In their view, interpretations that focused on events as unchangeable and outside ones' control would result in procrastination, while attributing problems as something changeable and situational, could give procrastinators the sense of control they needed to reduce their procrastination.

Today, the most comprehensive theory on procrastination was authored by Steel and König (2006), the TMT, Temporal Motivation Theory. TMT incorporates well-established factors in motivated behavior (i.e., expectancy and value) to explain why we aim at specific goals, and – importantly – factors that are particularly relevant to procrastination: Impulsiveness (sensitivity to delay) and delay (time to goal attainment). Incorporated in this model is the principle of temporal discounting, that long-term larger goals are discounted in favor of smaller temptations present here and now (e.g., König & Kleinmann, 2004).

1.3 Prevalence

Procrastination is a very common problem. In the general population, the prevalence of procrastination has been estimated to be between 13 and 20% (Harriott & Ferrari, 1996; Ferrari, O'Callaghan & Newbegin, 2005), with the student populations found to be the double or even triple of these prevalence estimates (Ellis & Knaus, 1973; Day, Mensink, & O'Sullivan, 2000; Steel, 2007). In fact, the high prevalence of procrastination among students in college and university has led to procrastination sometimes being referred to as the "student syndrome" (Gafni & Geri, 2010), with a majority of students wishing they could reduce their procrastination (Solomon & Rothblum. 1984).

These estimates must be interpreted with some caution, as they may depend on definitions, criteria (e.g., duration, frequency), and instruments used. In an influential book, Ellis and Knaus (1977) defined procrastination as the lack or absence of self-regulated

performance and the behavioral tendency to postpone what is necessary to reach a goal, and estimated that more than 90% of students procrastinated, with 25% of these students being chronic procrastinators. Day, Mensink, and O'Sullivan (2000) defined procrastination as unnecessarily putting off tasks even at the risk of negative effects, finding that 32% of the participants could be considered severe procrastinators.

The amount of time lost procrastinating is also considerable. Using an experience sampling method, Pychyl et al. (2000) asked students to answer 8 times per day over five days what they were doing and to what extent they thought they were procrastinating. Results showed that student procrastination accounted for more than one third of daily activities, manifesting itself in the form of sleeping, reading or watching television. Similarly, Klassen et al. (2010) found that 40% of students spend three hours or more on daily procrastination, with their students engaging in eating and drinking, watching TV, sleeping and using the internet as their dilatory behaviors. Clearly then, although the prevalence rates might vary depending on definitions, criteria, and measurements used, it is in all forms of definitions and measures a common problem that can negatively affect a large part of the population (15-20%), and more so in the student population (50%) (see e.g., Rozental & Carlbring, 2014, for review).

1.4 Consequences, causes, and correlates

The tendency to procrastinate necessary and important tasks comes with a personal and social cost (Sirois & Pychyl, 2013). Procrastinators are often fully aware that their dilatory behavior have negative consequences (Lindblom-Ylänne et al., 2015). An obvious consequence of procrastination is less time available to spend on a focal task (Lay, 1986; Tice & Baumeister, 1997). Less time to complete a task can result in increased stress (Sirois, 2014), and a suboptimal timeframe to complete work, with degraded performance as a result

(Kim & Seo, 2015; Tice & Baumeister, 1997). Further, procrastination has also been associated with depression and anxiety (Flett, Blankstein, & Martin, 1995; Stöber & Joormann, 2001), worry (Ferrari, Johnson, & McCown, 1995), and shame and guilt (Fee & Tangney, 2000; Pychyl et al., 2000). Procrastinators also report lower levels of self-compassion, suggesting that self-kindness and self-acceptance may be difficult for those who needlessly delay (Sirois, 2014). Students who procrastinate are shown to be become more anxious and stressed as the semester progresses (Rothblum, Solomon, & Murakami, 1986; Tice & Baumeister, 1997), as well as being more agitated before a test than non-procrastinators (Lay & Schouwenburg, 1993).

In addition to procrastination being detrimental to mental health, procrastinators have also been shown to have poorer physical health. Procrastinators more often neglect their physical well-being, delaying going to necessary physical exams, doctors' and dentist appointments (Sirois, 2007; Sirois & Pychyl, 2002; Tice & Baumeister, 1997), in addition to performing less wellness behaviors such as healthy eating and exercising (Sirois, 2007). Avoiding or delaying seeking medical care when necessary can result in late detection of disease, reducing survival, and increase the severity of a condition, ultimately resulting in increased costs both to the individual and society.

Lastly, procrastination has been associated with a variety of negative financial and well-being outcomes. Procrastinators more often have poorer financial and occupational success (Mehrabian, 2000), lower education (Steel & Ferrari, 2013) and poorer paying jobs (Nguyen, Steel & Ferrari, 2013). This combined with a tendency to delay paying taxes and starting pension savings (Byrne et al., 2006; Steel, 2007) leaves procrastinators more vulnerable to economic struggles (Gamst-Klaussen, Steel, & Svartdal, 2019) and a reduced quality of life.

Factors that foster procrastination. A large amount of literature on procrastination has attempted to explain why people procrastinate. Being described as a prototypical example of self-regulation failure (Steel, 2007), procrastination is from this perspective a failure to regulate ones impulses to escape from aversive stimuli or to prevent falling for the temptation of more enjoyable activities. In fact, the core of procrastination is consistently shown to be a result of self-regulation failure in both quantitative and qualitative studies (Steel & Klingsieck, 2016). When queried, procrastinators report that working on difficult tasks makes them feel anxious and worried, and that by procrastinating, they can escape from these negative feelings (Solomon & Rothblum, 1984). This also aligns with impulsivity being found as one of the strongest correlates of procrastination (Gustavson et al., 2014), together with low conscientiousness and lack of self-control (Rozental & Carlbring, 2014; Steel, 2007). Hence, procrastinators seem to have a higher preference for immediate rewards compared to non-procrastinators (Wu et al., 2016), and a tendency to engage in short-term mood repair (Sirois & Pychyl, 2013) as well as a lower ability to delay gratification, resulting in "giving in to feel good" (Tice & Bratslavsky, 2000). Table 1 summarizes these and other correlations.

Table 1
Summary of procrastination correlational findings, adaptation from Steel (2007)

Construct	Number of studies K	Sample Total N	Average weighted *r*	95% Confidence interval
Demographics/Ability				
Age				
Uncorrected age	16	-	-.15	-.20, -.10
Corrected age	16	-	-.48	-.70, -.25
Gender, Male = 1 Female = 2	44	-	-.08	-.12, -.05
Intelligence	14	2 151	.03	-.03, .09
Individual traits				
Big 5 Personality traits				
Neuroticism	59	10 720	.24	.21, .26
Openness to Experience	16	3 612	.03	-.02, .08
Agreeableness	24	5 001	-.12	-.15, -.08
Extraversion	27	5 032	-.12	-.15, -.09
Conscientiousness	20	4 012	-.62	-.65, -.60
Impulsiveness	22	4 005	.41	.37, .46
Fear of failure	57	10 785	.18	.15, .20
Perfectionism	24	3 884	-.03	-.09, .02
Self-efficacy	39	6 994	-.38	-.42, -.34
Self-esteem	33	5 748	-.27	-.31, -.24
Self-handicapping	16	2 784	.46	.40, .51
Self-regulation				
Self-Control	21	3 840	-.58	-.62, -.53
Distractibility	13	2 232	.45	.39, .51
Organization	25	4 757	-.36	-.41, -.31
Affect				
Depression	56	10 728	.28	.26, .31

Procrastination has also been investigated from a cognitive perspective. Several authors have suggested that irrational thoughts and beliefs are important explanations for procrastination (Balkis, Duru & Bulus, 2013; Pychyl & Flett, 2012). For example, students might belive they have to be in the right mood in order to study successfully, or belive that they work better under pressure (Ferrari 2001; Klingsieck et al., 2013). While some irrational thoughts might be the result of an ad hoc excuse to save face after procrastinating (Sirois &

Pychyl, 2013), research has found correlations between irrational thoughts and increased procrastination (Balkis, Duru & Bulus, 2013; McCown, Blake & Keiser, 2012). In addition, cognitive behaviour therapy aimed at correcting irrational thoughts has shown positive results (e.g. Ozer, Demir & Ferrari, 2013), further indicating that irrational thoughts have a negative effect on procrastination. Several studies demonstrate how lower self-efficacy is related to higher levels of procrastination (Kahn, 2011; Klassen, Krawchuk & Rajani, 2008). Although the causal direction between self-efficacy and procrastination is unclear (i.e., low-self efficacy might lead or procrastination, or vice versa, or both may be attributed to common factors), research indicates that increasing self-efficacy can reduce procrastination, resulting in a "virtuous circle of self-efficacy" by reciprocally amplifying feedback loops (Wäschle et al., 2014).

Another obviously important antecedent to procrastination is the task itself, as some tasks are procrastinated more than others. As discussed by Steel (2007), task aversiveness is a major correlate and also cause of procrastination. For example, Solomon and Rothblum (1984) developed a procrastination scale (PASS) showing that students struggle with writing term papers, followed by studying for exams and keeping on track with their weekly reading. Hence, the role of task aversiveness in procrastination is important, but unfortunately not well researched.

Interacting variables. In discussing causes and consequences of procrastination, one must be aware that procrastination may relate to other variables in complex ways (Steel, 2007). First, as in the examples discussed, procrastination may causally invoke problems, as when a task with a short deadline is delayed. Second, procrastination may itself be a consequence of problems, as when a student low in self-efficacy delays academic work. Third, procrastination may correlate with other variables because a common factor influence both. Thus, it is important to point out that studies on both causes and consequences of

procrastination have been mainly correlational, and one should take care to infer causation. Although the direction of these influences can be more easily understood in some cases (i.e., paying one's bill too late, can incur extra costs and result in more financial problems), in other cases the direction of influence can go in either direction, or even both at once. For example, with anxiety, depression and stress, it is feasible that these factors can just as well be the consequence, the cause, as well as interacting with each other.

2 The current thesis

The previous sections have presented a general introduction into the field of procrastination, including definitions, history, consequences, as well as correlates to, and causes of, procrastination. The following sections will focus on the topics of particular relevance to the current thesis, validation of procrastination instruments, procrastination interventions, and how academic environments relate to procrastination. Before going more deeply into these topics, we discuss why these topics are of particular interest.

First, validation of instruments is an important and necessary process in psychological research. Validation is necessary to ensure that instruments actually measure the constructs of interest. Further, instruments are sometimes translated and used in countries and cultures other than their place of origin, without making sure that the instrument has retained its original properties. To complicate things, the same language is sometimes used in widely different cultures (e.g., United States versus South Africa), masking potential cultural differences that can affect how instruments are interpreted and answered by respondents of the same language. For example, in a study by Klassen et al., (2010), students from Singapore and Canada were compared using the Tuckman Procrastination Scale, taking into account different interpretations of the phenomenon of procrastination, but disregarding how the scale items might be interpreted differently in different cultures. While these authors recognize

some of these shortcomings, such as how interpretation of procrastination might be influenced by cultural background, these methodological problems can lead to erroneous conclusions that can be hard to detect (Sperber, Devellis & Boehlecke, 1994).

In the context of the current thesis, we focus on the validation of two recent measures of procrastination, the PPS (Pure Procrastination Scale; Steel, 2010) and the IPS (Irrational Procrastination Scale; Steel 2010). At the time this project started, these measures had already been translated from English and used in several European countries (Rebetez et al., 2014; Rozental et al., 2014), including Norway (Svartdal, 2017), with validation efforts resulting in somewhat different results in relation to factor structure. Hence, using these instruments in the current project suggested a thorough validation. In addition, a cross-cultural comparison and validation of the PPS and IPS instruments is an important contribution to the procrastination research field in its own right.

Second, several authors in the procrastination research community have pointed out the scarcity of intervention studies (e.g. Klingsieck, 2013; Rozental et al., 2015), requested more testing of already suggested interventions, and the development of new ones (Hafner, Oberst & Stock, 2014; Wäschle et al., 2014; Toker & Avci, 2015). As a contribution to this area of procrastination research, we test if the combination of several suggested intervention measures delivered in a lecture setting, can help students reduce their procrastination. When delivering an intervention to large groups of students simultaneously even small effects could be of great value, and hence worth implementing.

Finally, procrastination has thus far largely been viewed as a personal problem, both as a phenomenon and in how interventions are constructed. This is surprising when considering how previous research have pointed out the relative lack of research on social and environmental aspects (Klingsieck et al., 2013). This is especially the case in the academic settings, where students are exposed to a multitude of different social and environmental

factors. In fact, in several qualitative studies, students have explicitly expressed various exogenous factors as causes for their procrastination (Grunschel, Patrzek & Fries, 2013; Klingsieck et al., 2013). In one qualitative study, a student was quoted saying "If you have people around you and the weather is good, then there are lots of other things to do" (Klingsieck et al., 2013). In other words, students have repeatedly told researchers that external factors influence their procrastination, but perhaps we (as researchers) have not been listening well enough. In fact, our own intervention study is also based on helping students "help themselves". Hence, in our third study, we investigate how different academic environments is related to student procrastination. By initiating this line of research, we look outside students themselves, and open up new ways of implementing interventions that can help students.

2.1 Measuring procrastination

Procrastination is typically measured using self-report instruments. Self-report instruments offer several advantages both in research and in clinical/applied settings. For example, self-report instruments offer an inexpensive and efficient way to obtain data, can be used with larger samples, and work well in combination with online distribution platforms such as Qualtrics.com. Also, self-report instruments allow core features of procrastination to be measured in ways that would be difficult through other measures (e.g., behavioral). One such feature is that procrastination scales may address procrastination in one or several of the typical phases of planned task execution (Sheeran & Webb, 2016), decision, implementation, and timeliness (Svartdal & Steel, 2017). Another feature is that scales may distinguish between delay and irrational delay (e.g., the Irrational Procrastination Scale; Steel, 2010), as procrastination is not merely a delay in task execution, but reflects delays that are chosen despite realizing that the delay will be disadvantageous (Steel, 2010).

Typically, instruments used to measure procrastination contain items related to general tendencies to delay (e.g., “I generally delay before starting on work I have to do”), or more specific forms of delay (e.g., “I always seem to end up shopping for birthday or Christmas gifts at the last minute”). Scales may focus on retrospective accounts of recent behavior (e.g., “This week, I waited until the last minute to work on assignments”) or on more metacognitive cognitions related to unnecessary delay (e.g., “I put things off so long that my well-being or efficiency unnecessarily suffers”). Table 2 summarizes commonly used procrastination scales. As is seen from the table, different scales focus on different aspect of procrastination. Some procrastination scales attempt to be more general and all-encompassing, others are more specific to certain forms of procrastination. For example, the Decisional Procrastination Scale (DPS; Mann, 1982, unpublished; Mann et al., 1997) focuses on delay in decisions (e.g., “I don’t make decisions unless I really have to”), while the commonly used General Procrastination Scale (Lay, 1986) has 20 items to measure various aspects of unnecessary delay, many in task implementation (e.g., “I often find myself performing tasks that I had intended to do days before”). Also often used is the Adult Inventory of Procrastination (AIP; McCown, Johnson & Petzel, 1989), including 15 items addressing specific facets of procrastination, including timeliness and meeting deadlines.

Table 2

Commonly used procrastination scales. Scales in bold are explicitly discussed in this thesis

Name (abbreviation)	*Publication, year*
Decisional Procrastination Questionnaire (DPQ)	**Mann, 1982**
Aitken Procrastination Inventory (API)	Aitken, 1982
Procrastination Assessment Scale -Student (PASS)	Solomon & Rothblum, 1984
General Procrastination Scale (GPS)	**Lay, 1986**
Adult Inventory of Procrastination (AIP)	**McCown et al., 1989**
Tuckman Procrastination Scale (TPQ)	Tuckman, 1991
Academic Procrastination State Inventory (APSI)	Schouwenburg, 1995
Procrastinatory Cognitions Inventory (PCI)	Stainton, Lay & Flett, 2000
Metacognitive Beliefs About Procrastination Questionnaire (MBPQ)	Fernie et al., 2009
Pure Procrastination Scale (PPS)	**Steel, 2010**
Irrational Procrastination Scale (IPS)	**Steel, 2010**
Academic Procrastination Scale (APS)	Mccloskey & Scielzo, 2015

In the current thesis, we use IPS (Steel, 2010) as a measure of academic procrastination. Although this scale has no items addressing academic procrastination per se, this scale should still reflect academic procrastination when used in the academic context, as specific reference to delay in academic tasks is not necessary to measure such delay. This is seen in several studies investigating academic procrastination. For example, the Tuckman procrastination scale (16 items; 1991) measures academic procrastination solely by general items (e.g., "I needlessly delay finishing jobs, even when they're important").
Also, the GPS (Lay, 1986, 20 items) has an academic version with 16 items shared with the general version. The Tuckman scale and GPS (student version) correlate highly with other general measures of procrastination, and general scales including the IPS and PPS have often been used to measure academic procrastination (e.g Corkin et al., 2014; Steel & Klingsieck, 2016; Wu & Fan, 2017; Steel et al., 2018).

Because self-reported procrastination addresses the tendency to delay intended tasks, procrastination scales should be validated against realistic behavioral examples of procrastinatory behaviors (e.g. Crowne & Marlowe, 1964; Paulhaus, 1991). Such validation

efforts have been routinely performed both in academic procrastination and in procrastination in the general population. For example, Tuckman (1991) identified items that tapped academic procrastination (e.g., "I needlessly delay finishing jobs, even when they're important," and "I postpone starting in on things I don't like to do"), and validated scores on this scale against actual performance points on voluntary homework assignments. He found a strong negative correlation, r = -.54, between these measures, and concluded that the relationship between them was sufficiently strong to suggest that "students are well aware of their own tendencies and can report them with great accuracy" (p. 9). Similarly, Tice and Baumeister (1997) found a correlation of r = .37 – r = .45, between paper turn-ins and self-reported procrastination. Focusing on the general population, Lay (1986) recruited passengers at an airport and found that respondents scoring higher on self-reported procrastination measure also delayed more in mailing back the results at a predestined date. Other relations found between procrastination self-reports and behavior include bedtime procrastination (Kroese et al., 2014), delay in health seeking behaviors (Stead, Shanahan & Neufeld, 2010) and job searching (Van Hooft et al., 2005; Steel et al., 2018).

The studies discussed indicate that the self-report measures mentioned demonstrate validity – they seem to measure what they intend to measure. Most of the scales discussed demonstrate at least basic psychometric properties in terms of internal consistency and test-retest reliability, predictable relations to other scales (discriminant and convergent validity), whereas the factorial structures of the scales often have been neglected or, if tested, has demonstrated divergent results. For example, Lay (1986) suggested that the General Procrastination Scale (GPS) – one of the most frequently used procrastination scales – confirmed to a unidimensional construct. Surprisingly, few studies have examined this scale psychometrically. In one study, Argiropoulou and Ferrari (2015) suggested a two-factor solution (*delay* and *procrastination domains*), and a German study, testing the student version

of the GPS, could not confirm a one-factorial structure and instead proposed a reduced version – the GPS-K – consisting of nine items (Klingsieck & Fries, 2012). Svartdal and Steel (2017) discuss similar examples for other scales (e.g., AIP, DPS). It is also noteworthy that one of the scales discussed in this thesis, The Pure Procrastination (PPS; Steel, 2010), is based on three already established procrastination scales, the DPS, GPS, and AIP. Steel subjected the items of all these scales to factor analyses and found one factor addressing habitual or problematic delay. This factor contained 14 items of which 12 of the highest loading were selected for the PPS. All three established scales were represented in this selection. Steel (2010) also suggested a new scale, the Irrational Procrastination Scale (IPS). As this scale also focuses on habitual or problematic delay, or more correctly *implemental delay*, these two scales correlate highly, $r = 0.87$ (Steel, 2010).

Finally, as discussed, as most procrastination instruments were developed in English speaking countries, and few of them have been validated outside their country of origin, it is of interest to assess such scales over different cultures and other groups of interest (e.g., gender, age). As is well known, scale items may work differently depending on groups and culture, and direct translation of an instrument from one language to another does not guarantee that the same construct is being measured (Cha, Kim & Erlen, 2007; Sperber, 2004). Hence, in order to make meaningful comparisons between different groups, it is necessary to establish measurement invariance (measurement equivalence) of the instruments used. Measurement invariance implies that the instrument measures the latent construct in the same way across various subgroups of respondents (Meredith 1993; Chen & West, 2008). Unfortunately, in cross-cultural research it is rather the exception that equivalence across groups is tested on translated instruments before comparisons are conducted (Davidov et al., 2014), that often lead to potentially erroneous conclusions (Sperber, 2004). As will be

discussed, conducting a rigorous process of measurement invariance assessment is necessary (Kankaras & Moors, 2010).

2.2 Procrastination interventions

Research has shown that procrastination is related to a number of factors that can be changed in interventions, such as irrational thoughts (Balkis, Duru & Bulus, 2013; Pychyl & Flett, 2012), poor time management (Van der Meer, Jansen & Torenbeek, 2010) and task characteristics (Steel, 2007). Two recent meta-analyses (van Eerde & Klingsieck, 2018; Rozental et al., 2018), show that procrastination can be positively affected both short and long term (van Eerde & Klingsieck, 2018), with interventions utilizing CBT showing somewhat more promising. Although the effect sizes varied somewhat between the two meta-analysis (van Eerde & Klingsieck finding an overall effect size of 0.62, while Rozental et al., found a more modest effect size of 0.34), both found a significant effect of interventions against procrastination as a whole. However, both authors point out the scarcity of studies that could be included in the meta-analysis (19 studies for van Eerde and Klingsieck, and 12 for Rozental et al.,), calling for the need for more high quality intervention studies.

Cognitive behavior therapy (CBT) is often found as a main, or as a sub-component, in many procrastination interventions. With some forms of procrastination resulting from irrational thoughts and detrimental automatic behavior, therapy focusing on identifying and correcting such thoughts and behavior is sometimes seen as preferred treatment (Pychyl & Flett, 2012). For example, Ozer, Demir & Ferrari (2013) applied cognitive-behavioral therapy (CBT) using the ABC model in a short-term group treatment program, finding that the participants (N = 10) showed a significant reduction in academic and general procrastination scores after 5 times of 90 minute sessions at 8 week follow-up. Other studies have found

similarly positive results on reducing procrastination using group-CBT (Toker & Avci, 2015; Wang et al., 2015), as well as internet-based CBT (Rozental et al., 2015).

Time management is another often used form of intervention against procrastination, i.e., skills and behaviors relating to task and time awareness, planning, goal setting, prioritizing, scheduling, organizing, and establishing new and improved time habits (Hellsten & Rogers, 2009; Karas & Spada, 2009;Schmitz & Wiese, 2006). With several studies highlighting the issue of time management and self-study in first-year students (Kantanis, 2000; Lowe and Cook, 2003), and procrastinators often struggling with keeping up with deadlines, teaching time-management to students is often proposed as a way to reduce procrastination (e.g. Burka & Yuen, 2007). One aspect of time-management, gold setting for example, have already shown to be effective in helping students reach their deadlines through the use of implementation intentions (Gollwitzer, 1999). Implementation intentions means setting behavioral plans in the form of "if X happens, I will do Y" (Gollwitzer, 1999), and has found substantial empirical support (Gollwitzer & Sheeran, 2006). In fact, various approaches to gold setting have already resulted in an expansive literature with more than 400 correlational and experimental studies providing evidence for the validity of the goal-setting approach (Latham & Locke, 2007; Locke & Latham, 1990). Studies on procrastination also show that teaching procrastinators time-management, can help reduce procrastination (Van Eerde, 2003), as well as help students better distribute their workload across the semester (Hafner, Oberst & Stock, 2014). It should be noted that some researchers do not agree that time-management is the main concern for procrastinators , as studies focusing on time-management have failed to find a significant relationship between time-management and procrastination (e.g. Ackerman & Gross, 2005; Pychyl, Morin, & Salmon, 2000). Other examples related to time-management is the active use of deadlines to reduce procrastination,

with externally or internally set deadlines showing promising results (Ariely & Wertenbroch, 2002; Roberts, Fulton, & Semb, 1988).

Intervention studies on procrastination often uses an eclectic mix of techniques, theoretical frameworks, strategies and settings, often making it difficult to differentiate the effects of one strategy over another (van Eerde & Klingsieck, 2018). This is especially true for CBT-interventions, as most use a multitude of different strategies such as goal-setting, time-management, modeling, and learned industriousness (Steel, 2007; Ozer, Demin & Ferrari, 2013) among others, making it difficult to differentiate one form of intervention technique from another (van Eerde & Klingsieck, 2018; Rozental et al., 2018). Overall, the use of interventions against procrastination have shown positive effects on procrastination behavior, but more intervention studies are needed.

The lecture-based intervention described in the present thesis incorporated several of the aforementioned components. At the time of the study (2015), the need for a practical, cost-efficient and preventive initiative to reduce procrastination in the Norwegian student population was considered important, as a previous study (Botnmark, Kvalnes, & Svartdal, 2014) had pointed out an obvious need for students to reduce their procrastination. Further, by incorporating the intervention into the lectures of a first-year psychology class, all students get to learn psychology-relevant material, while students struggling with procrastination can also integrate theory into practice.

2.3 Environmental factors

As mentioned, studies on how environmental factors relate to procrastination are scarce in the procrastination research literature. When discussing environmental effects in academic settings, factors can be classified in three broad groups: Teacher/instructor effects, task characteristics, and social environment/peers. Several, if not all, of these factors fall

under the umbrella of social-psychology theories such as Social Learning theory (Bandura, 1977) and Social comparison theory (Festinger, 1954), where people both learn and compare themselves with others, also when it comes to procrastination behavior.

Teacher/instructor effects includes ways that can directly or indirectly influence student procrastination. Examples include choice of syllabus and term papers, exam forms, teaching style, as well as personal suitability and subject matter knowledge. For example, teachers might not take the time to properly structure a course, or show general disinterest in the subject they are teaching. Studies indicate that this can negatively impact student procrastination. For example, unorganized and lax teachers have been found to promote procrastination (Grunschel, Patrzek, & Fries, 2013), while instructors with high expectations and student involvement increase students' class enjoyment and reduce procrastination (Corkin et al. 2014). Further, teachers can affect student procrastination through the use of deadlines, as several studies indicate that strict deadlines can reduce procrastination and increase academic performance (Grunschel, Patrzek & Fries, 2013; Lamwers and Jazwinski 1989; Wesp 1986), while being lenient with deadlines can promote procrastination (Schraw, Wadkins & Olafson, 2007). Finally, overly controlling teaching styles that restricts students' perceived autonomy might cause students to procrastinate more, while a more autonomous-supportive teaching style might increase student motivation and reduce procrastination (Codina et al., 2018).

Task characteristics is a significant factor in procrastination. Task aversiveness is typically defined in terms of how unpleasant or unenjoyable a task is to perform (e.g., Lay, 1992). In general, the more aversive the task, the more it is delayed (Steel, 2007). However, how aversive a task is percieved is not always obvious. For example, task difficulty can affect task aversiveness in various ways; if the task is too easy, it quickly becomes boring and uninteresting, if a task is too hard, uncertainties on how to proceed and the fear of failing can

lead to postponement (Steel, 2007; van Eerde, 2000). Conversely, recreational activities are often highly challenging but not procrastinated. Some studies have also found how changes in mood and situations can change the relative aversiveness of a task (Sirois & Pychyl, 2013). For example, recalling a previously procrastinated task can result in feelings of anxiety and hopelessness (Lay, 1992), and negative self-evaluations (Flett, Blankstein, & Martin, 1995), potentially pushing students back into procrastination an an effort to perforom "mood repair". Lastly, task aversiveness and procrastination can vary across different stages of a project. While initial stages of a project can be fun, engaging and filled with personal meaning, later stages are often characterized by uncertanty, boredom, frustation and resentment, that result in more procrastination (Blunt & Pychyl, 2000).

Academic environment and peers are important parts of being a student, and can significantly affect student procrastination. Although not specifically focusing on procrastination, studies on peer effects show how grades, study effort, drop out decisions and beliefs about the importance of education is partly affected by peers (Stinebrickner & Stinebrickner, 2006), and that high-quality peers could positively affect effort levels and outcomes among students (Foster & Frijters, 2010). In other words, being paired with non-procrastinating peers with high regards of the importance of education could have a positive effect on their peers' motivation towards academic work (Eisenkopf, 2009). Social comparison theory (Festinger 1964) states that people evaluate themselves by comparing with others. For example, it is not necessarily obvious to students how much they need to work on their academic material, and use their peers to gauge their workload. Hence, among both students and employees alike, to remain competitive or to avoid being judged negatively by others, students might adjust their efforts according to those around oneself in an effort to fit in (Ferrari & Patel, 2004).

In summary, students are both directly and indirectly influenced by their environment in ways that can affect academic procrastination. Teachers can prevent procrastination through course involvement and the use of deadlines, while students can either positively or negatively affect each other to procrastinate. If students that are prone to procrastination is put in an environment with uninspiring teachers, "lazy" peers, lax deadlines and boring tasks, the compounding of such negative factors can result in a highly "procrastination friendly" environment. In the present thesis, environmental factors were more formally assessed (Study 3).

3 Research questions and methodology

The current thesis consists of three articles that contribute to their respective domain within procrastination research. The first article assesses the dimensionality and tests the validity of the translation of two procrastination measures, the IPS (Irrational Procrastination Scale) and the PPS (Pure Procrastination Scale), as well as the Susceptibility to Temptation Scale (STS; Steel, 2010) in six different European countries. The second article evaluates the effect of a brief lecture-based intervention against academic procrastination in first year psychology students. Finally, the third article investigate potential environmental causes of procrastination, specifically how structure and environments in different academic disciplines can affect student procrastination differentially. Study 2 (intervention study) is a quasi-experimental study due to lack of control-group, while Study 1 and Study 3 uses correlational data. Data analysis uses standard statistical procedures including ANOVA, contrast analysis and CFA (Confirmatory Factor Analysis) to test factor structure and invariance.

3.1 Article 1: On the Measurement of Procrastination: Comparing Two Scales in Six European Countries

As discussed, the Pure Procrastination Scale (PPS; Steel, 2010) scale is based on three already established procrastination scales (the DPS, GPS, and AIP), and measures habitual delay related to implementation of plans. The second scale, the Irrational Procrastination Scale (IPS; Steel, 2010), is composed of new items addressing "irrational" and implemental delay. The scales were originally developed in English and validated by Steel (2010). The two new procrastination instruments showed improved convergent validity with other related measures, above that of other measures of procrastination.

However, since their development and initial testing (Steel, 2010), few attempts have been made to establish the psychometric properties, including the dimensionality, of these instruments in other languages. The few attempts that have made efforts to translate and validate the IPS and PPS as a measure of procrastination, resulted in somewhat different results in relation to factor structure. A French evaluation resulted in the PPS two-factor solution of the PPS with 11 items instead of 12, loading on the two factors "voluntary delay" and "observed delay" (Rebetez et al., 2014). Using a clinical sample, a Swedish evaluation of the PPS and IPS showed that the PPS fit a two-factor solution containing items related to delaying decision making, not meeting deadlines, and missing appointments, while the other factor was associated with starting late, lagging behind, and wasting time (Rozental et al., 2014). The IPS was found to encompass two factors, with the second factor involving only those items that were scored in reverse. Finally, a Norwegian evaluation of both the PPS and the IPS (Svartdal, 2015) indicated one-factor solutions consistent with initial assumptions by Steel (2010).

The main purpose of this study was to assess, in a sample from Finland, Germany, Italy, Norway, Poland, and Sweden, the dimensionality of these two procrastination measures

using CFA based on initial findings by Steel (2007) as well as the results from France, Sweden and Norway (Rebetez et al.,2014; Rozental et al., 2014; Svartdal, 2015). Further, the Susceptibility to Temptation Scale (STS; Steel, 2010), is a measure of impulsiveness and the tendency to give in to temptations, was also translated to provide convergent validity for the two procrastination scales. The second purpose of this study was to assess measurement equivalence across the six countries that participated (i.e., a cross-cultural validation).

3.2 Article 2: Intervention to reduce procrastination in first-year students: Preliminary results from a Norwegian study

In spite of procrastination being a serious problem negatively affecting a great number of people every day, research on procrastination have mainly concerned itself with causes and consequences, paying less attention on developing interventions that can help those who struggle with the problem. The development of interventions that can effectively target student procrastination is vital in order to help students perform better academically. Previous research have shown a variety of different strategies to reducing procrastination among students. For example, Häfner, Oberst, and Stock (2014) used at four-hour time management program that instructed students in time management, with results showing significant improvements in students abilities to distribute workload across the term. Further, cognitive behavior therapy has been shown to have positive effects on procrastination. Both the use of short-term group treatment programs (Ozer, Demir & Ferrari, 2013) and internet based cognitive behavior therapy have been shown to be effective against student procrastination.

Based on these and other findings, we developed a four-week, one hour per week, intervention program containing a combination of elements previously found to be effective in reducing academic procrastination. Namely, we raised self-awareness of procrastination by teaching students about causes and consequences of procrastination, instructed students in

proper time-management, and instructed students in the use of cognitive behavioral therapy techniques (CBT) to manage negative feelings and thoughts, as well as stress reduction.

3.3 Article 3: Do procrastination-friendly environments make students delay unnecessarily?

Research on procrastination has mainly identified procrastination as essentially a personal problem, with relatively little regard to social, cultural, and structural factors. This is surprising because being a student is fundamentally a social endeavor. Further, most research on academic procrastination make little attempts at distinguishing one academic environment from another, seemingly assuming that procrastination is much the same regardless of academic discipline. Accordingly, the present study takes a different approach, focusing instead on the role of different academic environments in fostering procrastination. There are a number of factors that vary between academic disciplines that could affect how much students procrastinate, with each discipline having their own distinct culture with customs and practices, teaching preferences, transmitted knowledge, beliefs, laws and morals, linguistics, and symbolic form of communication (Becher, 1994). For example, lecturers in natural science departments typically prefer formal and structured approaches to teaching and assessment, whereas lecturers in the arts and humanities endorse a more flexible and individualistic approach (Gaff, Crombag, & Chang, 1976; Ramsden, 1997). Also, content knowledge itself in arts and humanities has been described as needing more interpretation, comparison, and generalization, whereas knowledge in hard sciences is seen as more hierarchical, logical, heterogeneous, and rule- and procedure-governed (Biglan, 1973; Ramsden, 1997; Schachter, Christenfeld, Ravina, & Bilous, 1991). Hence, the goal of article 3 was to explore role of environmental factors in academic procrastination by focusing on

culture differences between the three academic disciplines Medicine, Natural Sciences, and Humanities.

The first part of the article (Study 1) establishes the existence of structural and cultural differences between the three academic disciplines. Based on previous literature, we identified six dimensions believed to be relevant to academic procrastination: *Rote learning and memorizing*, *tangible knowledge*, *reflection and afterthought*, *structured course progression*, *high demands and grade pressure*, and *freedom in the study situation*. We then asked students to evaluate three different academic disciplines (Medicine, Humanities and Natural Sciences) on a continuum from low to high in these dimensions. In the second part of the article (Study 2), we examine the relations between academic procrastination and environmental factors believed to influence student procrastination. These factors include the six dimensions identified in study one, as well as peer procrastination, peer influence, as well as socially induced procrastination, and how these factors relate to dispositional tendency to procrastinate.

3.4 Methodological approach and ethics

Article 1 focuses on the factor structures of the IPS and PPS procrastination measure, and articles 2 and 3 used the (Norwegian) IPS as a measurement of procrastination. All three articles used convenience sampling, and a web-based questionnaire (qualtrics.com) for data collection.

In all studies, participants were informed that participation was voluntary and anonymous and that they could withdraw from the study at any time. Except for Study 1 of article 3, online informed consent was given by confirming that they had read and agreed to the information by pressing a “start survey” button. Data gathering for Study 1 of Article 3 was done on campus using convenience sampling using pen and paper. The current project is

a part of a larger study on procrastination, which has ethical approval from the Regional Ethical Board in Tromsø, Norway (REK nord 2014/2313)

Article 1: On the Measurement of Procrastination. Students are often of particular interest when it comes to procrastination, and two-thirds of the participants was students recruited from universities in six different European countries; Finland, Germany, Italy, Norway, Poland, and Sweden. The final third of the participants was working individuals, mainly from Germany, Norway, and Sweden. All instruments used was provided in their native language. Data collection was performed over 2 months by the authors in the respective countries, using email invitations and lectures at institutes and institutions, as well as through social media. The main advantage of such data collection methods is that it facilitates the gathering of large amounts of participants in a short period of time. The main disadvantage being the possibility of sampling bias. For example, when using lectures as a recruitment area for participants, this necessarily implies that there are similarities between the students in any one particular lecture or academic discipline (i.e. medicine vs social sciences), which might also extend to procrastination tendencies. As recruitment was performed across several different lectures, academic disciplines as well as e-mails and social media in their respective countries, a more heterogeneous sample of students should be achieved, reducing the chance of possible sampling bias. The use of e-mail and social media makes it more difficult to control who, where, and when, the response of the questionnaire is done. Participants recruited at lectures might be more attentive when the recruiter or lecturer is present during the data gathering, while participants outside this setting might be in a more distracting environments or otherwise less engaged in the questionnaire. However, research on the use of web surveys and traditional classroom collection have shown that the methods produce similar results (Paolacci, Chandler & Ipeirotis, 2010), and should thus not result in systematic error.

The translations of the three scales were done with a lightly modified Brislin's back-translation model (Brislin 1970) for the languages that did not already have a translated version of the questionnaires. First, two persons (either the researchers themselves or English language and literature students) translated the English version into the target language. Second, a third person fluent in both languages blindly translated all items back into English. Third, this version was compared to the original English version checking for concept equivalence. In this step, all three persons were involved. Fourth, the new language versions were discussed with the whole research team in order to check whether all items were interpreted in a similar manner by different persons. Brislin's back-translation model is widely used for instrument validation in cross-cultural research (Cha, Kim & Erlen, 2007), and in the current study, the similarities between countries included should help retain a high validity of the translated versions of the measures.

Article 2: Intervention to reduce procrastination in first-year students. The participants in the intervention study was students enrolled in an introductory psychology course, with a majority being first-year students (i.e. students without prior experience at the university). There are a number of advantages with implementing an intervention as a part of the normal student curriculum. First, it allows for targeting large groups of students at the same time, some of which might not normally seek help even if they struggle with procrastination. Second, although no guarantee for adherence in everyday life, including contents of the intervention as a part of the course exam and final grade might motivate students to take the lessons more seriously. Third, coming to lectures represent a normal part of students everyday life, rather than an extra task, and should lower the threshold for attending the intervention, hence reducing problems of attrition. These and other benefits makes the development of a brief intervention implemented in lectures a valuable addition in helping students with their procrastination while being an efficient use of resources.

An intervention aimed at large groups of students necessarily has to be "broad", in the sense that those that struggle with procrastination represent a heterogeneous group with both different causes and solutions to their procrastination problems. By implementing a combination of elements previously found to be effective in reducing academic procrastination, it allows the students to find information and techniques that can help for them personally. For example, some students might procrastinate because of their perfectionistic tendencies (Pychyl & Flett, 2012), whereas other students might simply be severely disorganized, needing help learning time-management (Van der Meer, Jansen & Torenbeek, 2010).

Article 3: Do procrastination-friendly environments make students delay unnecessarily? For Study 1 of article 3, we initially assumed there was differences between academic disciplines that should affect procrastination. However, we found no definitive studies documenting such differences. Thus, we developed a "Procrastination friendliness scale" based on already well known factors that should affect procrastination. For example, freedom in the study situation has been likely to result in more procrastination (Born & Moore, 1978; Morris, Surber & Bijou, 1978), and we found it likely that some academic disciplines have more freedom in the study situation than others. See Table 3 for the full list of 6 dimensions of the "Procrastination friendliness scale". Participants was recruited by convenience sampling on campus, and the student participants were asked to fill out a pen and paper form based on their own intuitive judgement. Most participants (43) were students from one of the three academic disciplines in question (natural sciences, medicine, and humanities).

For Study 2 of article 3, we recruited students from three different academic disciplines, natural sciences, medicine, and humanities, during the middle of the fall and spring semesters. In this study, examine the relation between procrastination-relevant

environmental factors such as peer procrastination, peer influence, and exposure to academic environments, and their effect on academic procrastination. We wanted to examine if and how differences between academic disciplines related to procrastination-relevant factors, and if such differences are modulated by dispositional tendency to procrastinate. We developed different scales containing items related to peer procrastination (e.g. “My fellow students rarely delay schoolwork.”), peer influence (e.g. “When I am late with my schoolwork, I find it reassuring that other students are also behind on”), as well as a category we named “Socially-induced academic procrastination (SIAP) (e.g. “When I am at the university to work, I often get distracted by activities with my fellow students”). We also asked questions on how much exposure the students had to the academic environment (e.g. “I spend a lot of time on the university”), as degree of exposure could either enhance or decrease the effects of other environmental factors.

4 Summary of results

4.1 Article 1: On the Measurement of Procrastination

The dimensionality of the PPS and IPS was evaluated using CFA using the complete sample as well as the subsamples (individual country). This was legitimate, as previous research suggested clear theories to test. Results for the PPS showed that the initially suggested one-factor model by Steel (2010) did not demonstrate acceptable fit. Best fit was found using a three-factor solution that adhered to the origin of the items comprising it (i.e., the DPS, GPS, and AIP), with complete sample showing a RMSEA_SB = 0.069, CFI = 0.955, and SRMR = 0.037. Steel (2010) also suggested that the IPS was composed of one-factor, while later investigations by Rozental et al. (2014) proposed a two-factor solution with reversed items loading on a different factor. Results showed that both models demonstrated

acceptable fit for the complete sample, while individual nations indicated acceptable fit for the one-factor model except for Finland and Sweden.

Importantly, the middle items of PPS (i.e., items 4-8, originally from GPS items 12, 7, 1, 19 and 9), seem to measure implemental procrastination. Thus, when comparing the scales, the complete PPS and IPS showed a somewhat different mean score, with PPS showing consistently lower scores compared to IPS overall and in individual countries. In contrast, PPS items 4–8 correlate highly with PPS and IPS and also demonstrate very similar mean scores. This indicates that items 4-8 of the PPS measures procrastination in a similar manner as IPS. Thus, items 4-8 of the PPS might be used as a reduced measure of procrastination, with minimal loss of data.

Assessment of the measurement equivalence was performed Multigroup CFA for the three-factor model for the PPS, and the one-factor models for the IPS, using four increasingly rigorous tests of measurement equivalence (i.e., configural, loadings, intercepts, and means). The PPS demonstrated configural invariance across countries (S_B χ 2 = 1239.8, df = 306, RMSEA_SB = 0.080, CFI_SB = 0.951), hence demonstrating a similar pattern of response between countries. However, items 9-12 of the PPS demonstrated a somewhat poorer fit than the remaining items. Items 9-12 of the PPS originates from the AIP, and is more related to timeliness than the remainder of the items. The IPS indicated structural invariance across the full sample (RMSEA_SB = 0.09, CFI_SB = 0.955), with items 3 and 9 demonstrating poorest fit using pairwise comparisons between countries. For both measures (PPS and IPS), comparisons between females and males showed only a minor loss of fit from configural, to weak, to strong, to strict invariance (for PPS: RMSEA_SB = 0.076, CFI_SB = 0.953, strict RMSEA_SB = 0.071, CFI_SB = 0.951. For IPS: RMSEA_SB = 0.088, CFI_SB = 0.956, strict RMSEA_SB = 0.079, CFI_SB = 0.953.).

4.2 Article 2: Intervention to reduce procrastination in first-year students

We investigated if applying a lecture-based intervention across four consecutive weeks to a large group of students simultaneously could help reduce academic procrastination. We used a repeated measure ANOVA to investigate differences in IPS scores from pre- to post- among student volunteers, as well as a sub-set of items from the Self-Regulation Scale (SRS; Job et al., 2015) and the Time Management Questionnaire (TMQ; Britton and Tesser, 1991), as well as four questions on study motivation.

Results indicated an overall effect of time, $F(1, 108) = 5.48$, $p = .021$, meaning that the full student sample had a decrease in procrastination from pre to post. Subdividing the full sample into sub-groups of low (IPS < 2.5), medium (IPS 2.5-3.5) and high (IPS > 3.5) procrastinators, we found that students initially high in procrastination demonstrated the strongest positive change (contrast analysis, $F(1, 106) = 15.31$, $p = .00016$, $n^2 = .25$). Similarly, the selected sub-set of items from the SRS that focused on state procrastination indicated similar reduction (contrast analysis of the sub-groups, $F(1, 108) = 1\ 1.76$, $p = .0009$, $n^2 = .18$). Lastly, no changes in TMQ scores or study motivation were found between pre- post- in the complete sample. However, the high-procrastination group demonstrated an increase in TMQ scores that correlated strongly ($r = .52$) with reduction in IPS, while the low and medium procrastinating group demonstrated a stronger correlation between the TMQ and the state procrastination measure (SRS; $r = .41$ and .35).

4.3 Article 3: Do procrastination-friendly environments make students delay unnecessarily?

The third article investigated how environmental factors in different academic disciplines might influence academic procrastination. The first study focused on structural and cultural differences between three academic disciplines (medicine, natural sciences, and

humanities) thought to be relevant to procrastination, using a newly developed six-dimension "Procrastination-friendliness" scale. Results showed that students evaluated the three academic disciplines as significantly different from each other in dimensions thought to be related to procrastination. See Table 3. Comparing the mean of these disciplines showed that humanities scored significantly higher than natural sciences and medicine (3.51 versus 2.47 and 2.09 respectively), $F(2, 96) = 113.46$, $p < .00$, potentially making it more procrastination-friendly compared to medicine and natural sciences.

Table 3

Culture differences in study programs

Dimension	Natural sciences		Medicine		Humanities	
	Mean	SD	Mean	SD	Mean	SD
Rote learning / memorizing	3.65	1.03	4.53	0.71	3.02	1.05
Tangible knowledge	4.06	0.94	4.20	0.89	2.78	1.01
Reflection / afterthoughts	3.14	1.17	3.51	1.14	4.41	0.84
Structured course progression	4.04	0.84	4.47	0.68	2.92	1.12
High demands / grade pressure	3.74	1.00	4.22	1.20	2.82	0.88
Freedom in the study situation	3.16	1.20	2.45	1.14	4.18	0.81

Study 2 further investigates the relation between procrastination-relevant environmental factors and academic procrastination, using measures of social influences on procrastination, peer procrastination, peer influence, and exposure to academic environments. An overall ANOVA demonstrated a significant difference in IPS scores between natural sciences, medicine and humanities, $F(2, 212) = 6.91$, $p = .001$, with medicine showing the lowest scores, and humanities the highest. Measures of Socially-induced procrastination (SIAP), showed that students prone to procrastinate was more easily influenced to engage in procrastination, while students who had a low or no disposition to procrastinate (measured through IPS), was largely unaffected by their environment in relation to procrastination

behavior. Evaluations of peer procrastination showed a significant difference between academic disciplines, $F(2, 212) = 29.66$, $p < 00$, with students from humanities evaluating their peers to be procrastinating more than students from medicine and natural sciences did. However, peer procrastination scores also increased over IPS levels, indicating that students' evaluation of their peers procrastination might be influenced also by their own procrastination. As for peer influence, students in medicine demonstrated being influenced by their peers more so than students from natural sciences and humanities, $F(2, 212) = 8.63$, $p < .00$. Lastly, analysis of reported exposure to the academic environment demonstrated a reduction over increasing IPS levels, $F(2, 206) = 9.29$, $p < .00$. This indicates that students high in procrastination spends less time at the university and conversing with their peers, but instead elects to withdraw from the university scene and contact with their peers.

5 General discussion

The current thesis contributes to research on procrastination in three different ways. The first paper addresses the need to evaluate the psychometric properties of two measures of procrastination, the PPS and IPS, translated into six different European languages; Finnish, German, Italian, Norwegian, Polish and Swedish. With the evident struggle that many students have with procrastination, the second paper evaluates if a broad lecture-based intervention could be a cost-efficient way to teach students to reduce their procrastination. Finally, paper three investigate ways the academic environment itself can affect students to procrastinate. Procrastination has mainly been identified a personal problem (most often referred to as a dispositional trait), and by focusing on environmental factors, we look into new ways to understand and treat procrastination.

5.1 On the Measurement of Procrastination

Evaluating the psychometric properties of the PPS and IPS was done in two ways, one to address factor structure of the instruments, the second to evaluate measurement invariance between the different translations/countries. The first evaluation showed best fit indices for a three-factor model for the PPS, with each factor coinciding with where the original items came from (i.e., DPS, GPS and AIP), and also corresponding to three aspects of delay, i.e., decisional, behavioral, and timeliness. For the IPS, acceptable fit was found for both a one-factor and two-factor solution using the full sample, while results from individual nations indicated acceptable fit for a one-factor solution except for Finland and Sweden. The PPS three-factor solution has also found support in the data sets by Rebetez et al. (2014) and Rozental et al. (2014) (personal communication from both; see footnote 5 in Svartdal et al., 2016), as well as a more recent article by Svartdal and Steel (2017).

When comparing the scales, the PPS and IPS showed a somewhat different mean score, with PPS showing consistently lower scores compared to IPS overall and in individual countries. Closer inspection showed that the items 4–8 correlate highly with the IPS, implying that items 4-8 of the PPS measure procrastination similarly to the IPS. This again means that the reduced PPS and IPS measures procrastination in much the same way, including score means. Furthermore, the reduced PPS has also been suggested as a valid measure of procrastination based on a representative sample of the German population (Klein et al, 2017).

Results testing for measurement invariance demonstrated that both the PPS and IPS demonstrated at least weak (configural) invariance when comparing data across six countries. Further, weak invariance was found when testing the student-employee subsample, and strict (i.e., full scalar invariance) invariance when comparing the female-male subgroup. Overall, these cross-cultural and group comparisons indicate that the procrastination instruments

demonstrated the basic requirement for measurement invariance over countries and subgroups. In practice, full scalar invariance is rarely observed when tested for (e.g., Zercher et al., 2015), but this does not mean that scales cannot be used across different countries, only that comparisons and interpretations of mean differences across nations and groups cannot be done meaningfully. This means that reliable and valid translations of the PPS and IPS can now be used in research on procrastination, but caution should be made when comparing results between countries as well as between student and employee populations.

5.2 Intervention to reduce procrastination in first-year students

Results from the four-week lecture based intervention study showed a significant reduction in procrastination scores from pre-post, as measured by the Irrational Procrastination Scale (IPS) and a sub-selection of the Self-Regulation Scale (SRS) related to procrastination. Predictably, students who reported high levels of procrastination at the start of the intervention demonstrated the most positive change compared to little or no changes at lower procrastination levels. Further, reduction in procrastination scores coincided with increased scores on the Time Management Questionnaire (TMQ) in the high-procrastination group, while no changes were observed in the low- and mid-procrastination groups. These results agree with the classic study by Tuckman (1991), who demonstrated that a group-based intervention demonstrated largest benefit for the group most in need for reducing their procrastination. However, these results must be interpreted with caution, as a simple pre/post design with no control group is weak in identifying causal relations.

Several mechanics could explain the observed reduction in procrastination among the high-procrastination group. The most optimistic being that the intervention had the intended effect, and particularly the high procrastination group took advantage of the knowledge introduced in the lectures and seminars. This interpretation can also be supported by the

observed increase in time management skills among the high-procrastinating students. It has previously been reported that first-year university students often lack the necessary time-management skills needed to organize their more independent university life (Van der Meer, Jansen & Torenbeek 2010), and by teaching time-management, students with poor time-management skills can learn how to better organize their academic work, possibly resulting in less procrastination.

One factor to take into account is the logical observation that students high in procrastination have more room for improvement than students already low or moderate in procrastination. This also opens the possibility that the observed reduction in procrastination scores can occur as the result of statistical artifacts such as regression to the mean. Another possible explanation can be related to the timing of the intervention itself in the semester. As the end of the intervention and data-collection was placed relatively close to the end of the term, students might have been more compelled to work harder in order to keep up with their exam preparations, i.e. “deadline rush” (Dewitte & Schouwenburg, 2002; König & Kleinmann, 2004; Howell et al., 2006). However, it is unclear if experiencing the deadline rush result in reporting more procrastination, or less. For example, with exams and other deadlines approaching, time gets more valuable, and students might report more procrastination from even small incidences of procrastination. However, Wäschle et al. (2014) observed an opposite trend to the “deadline rush” in that the students in control conditions reported less procrastination as exams approached. This also seems more likely for our data, as procrastination levels were stable for low and medium procrastinators and decreased in high procrastinators, making it less likely that students become more sensitive to small incidents of procrastination the closer it gets to exams.

Although interventions against procrastination may be helpful, training students in preventive measures against procrastination might be a more preferred strategy than trying to

help students after problems have already emerged. A different way would be to focus on preventing procrastination from an institutional perspective. It is likely that various structural and cultural properties of academic life fosters procrastination in ways that could be reduced by changing the way academic studies are organized and taught, rather than trying to change students themselves.

5.3 Do procrastination-friendly environments make students delay unnecessarily?

Results from the first study demonstrated that there was a number of differences between academic disciplines on factors that could be considered relevant to academic procrastination. More specifically, students evaluated humanities as higher on dimensions that could be considered "procrastination-friendly" i.e., Freedom in the study situation, Reflection/afterthoughts, and less structured course progression, while both medicine and natural sciences were rated lower on these dimensions. In study 2, we found that, compared to medicine and natural sciences, students studying humanities reported more peers procrastinated, and were more prone to resort to procrastination due to social pressure. These differences also interacted with dispositional procrastination score, in that low-procrastinating students appeared relatively unaffected by environmental factors and study program, whereas students at higher dispositional procrastination levels reported higher degrees of social-pressure to procrastinate, but highly dependent on study program. Thus, at medium to high levels of dispositional procrastination, students from the humanities indicated significantly higher degree of SIAP compared to students in medicine and natural sciences, in addition to reporting higher degree of peer procrastination.

The results show that environments with peers that procrastinate can result in more procrastination, especially for students scoring high on dispositional procrastination. However, the results also indicate that social determinants of academic procrastination may

differ between student groups. This indicates that differences among study regimes affect the way students interact and hence how they foster academic procrastination. As for peer influence, medicine students reported to be significantly more influenced by their peers. This reasonable, given the high demands and grade pressure in medicine studies, as well as strong pressure to adhere to common medical and ethical values. The present results demonstrate that peer influence may have beneficial or detrimental effects, depending on peer procrastination level.

5.4 Final Remarks and future directions

The overarching goal of research on procrastination should always be to improve the lives of those struggling with the phenomenon. Designing interventions built on previous knowledge, and attaining new knowledge drives the field forward towards this goal. In addition to the more trait-oriented view of procrastination, our findings indicate that also environmental factors could be an important factor in academic procrastination that has so far been largely overlooked. Student do not procrastinate in isolation, but in synergy with their surrounded environment, and knowledge on this can be used to construct a less "procrastination friendly" teaching environment. Possible ways of how to implement this knowledge are numerous. For example, in a dispositional view of procrastination, one could make students aware of their own procrastination, and teach them techniques on how to reduce it. In a social/environmental view, students could be made aware of the effects they have on their peers, and encourage them in ways they can help each other to procrastinate less. From the side of instructors, understanding the importance of factors like course structure and freedom in the study situation can make it easier to balance these factors when designing new programs or updating old ones. Finally, as previous researchers like Biglan (1973) and Becher (1994) have pointed out, there is significant cultural and structural

differences in academic disciplines, and sometimes these factors are outside the control of both the student and instructor.

References

Ackerman, D. S., & Gross, B. L. (2005). My instructor made me do it: Task characteristics of procrastination. *Journal of Marketing education*, *27*(1), 5-13.

Ainslie, G. (1975). Specious reward: A behavioral theory of impulsiveness and impulse control. *Psychological Bulletin*, *82*(4), 463–496.

Aitken, M. E. (1982). *A personality profile of the college student procrastinator*. Unpublished doctoral dissertation, University of Pittsburgh.

Argiropoulou, M. I., & Ferrari, J. R. (2015). Chronic procrastination among emerging adults: factor structure of the Greek version of the general procrastination scale. *Hellenic Journal of Psychology*, *12*(2), 85-104.

Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological science*, *13*(3), 219-224.

Balkis, M., Duru, E., & Bulus, M. (2013). Analysis of the relation between academic procrastination, academic rational/irrational beliefs, time preferences to study for exams, and academic achievement: a structural model. *European journal of psychology of education*, *28*(3), 825-839.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

Becher, T. (1994). The significance of disciplinary differences. *Studies in Higher education*, *19*(2), 151-161.

Beswick, G., Rothblum, E. D., & Mann, L. (1988). Psychological antecedents of student procrastination. *Australian psychologist*, *23*(2), 207-217.

Bijou, S. W., Morris, E. K., & Parsons, J. A. (1976). A PSI course in child development with a procedure for reducing student procrastination. *Journal of Personalized Instruction*, *1*, 36-40

Biglan, A. (1973). The characteristics of subject matter in different academic areas. *Journal of applied Psychology*, *57*(3), 195.

Blatt, S. J., & Quinn, P. (1967). Punctual and Procrastination, Self-Consequences of Behavioral Procrastination: The Effects of Academic Procrastination, Self-Consciousness, Self-Esteem and Self-Handicapping. *Journal of Social Behavior and Personality*, *15*, 3-13.

Blunt, A. K., & Pychyl, T. A. (2000). Task aversiveness and procrastination: A multi-dimensional approach to task aversiveness across stages of personal projects. *Personality and Individual Differences*, *28*(1), 153-167.

Born, D. G., & Moore, M. C. (1978). Some belated thoughts on pacing. *Journal of Personalized Instruction, 3(1),* 33–36.

Botnmark, D. B., Kvalnes, S. S., & Svartdal, F. (2014). Prokrastinering–hvorfor studenter utsetter ting, og hvordan utsettelse påvirker velvære og helse. *Tidsskrift for Norsk psykologforening*, *51*(8), 616-623.

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of cross-cultural psychology*, *1*(3), 185-216.

Britton, B. K., & Tesser, A. (1991). Effects of time-management practices on college grades. *Journal of educational psychology*, *83*(3), 405.

Burka, J. B., & Yuen, L. M. (2007). *Procrastination: Why you do it, what to do about it now*. Hachette UK.

Byrne, A., Dowd, K., Blake, D. P., & Cairns, A. J. (2006). There's no time like the present: the cost of delaying retirement saving. *Financial Services Review*, *15*(3).

Cha, E. S., Kim, K. H., & Erlen, J. A. (2007). Translation of scales in cross-cultural research: issues and techniques. *Journal of advanced nursing*, *58*(4), 386-395.

Chen, F. F., & West, S. G. (2008). Measuring individualism and collectivism: The importance of considering differential components, reference groups, and measurement invariance. *Journal of Research in Personality*, *42*(2), 259-294.

Chowdhury, S. F., & Pychyl, T. A. (2018). A critique of the construct validity of active procrastination. *Personality and Individual Differences*, *120*, 7-12.

Chu, A. H. C., & Choi, J. N. (2005). Rethinking procrastination: Positive effects of" active" procrastination behavior on attitudes and performance. *The Journal of social psychology*, *145*(3), 245-264.

Codina, N., Valenzuela, R., Pestana, J. V., & Gonzalez-Conde, J. (2018). Relations between student procrastination and teaching styles: autonomy-supportive and controlling. *Frontiers in psychology*, *9*, 809.

Coote-Weymann, E. C. (1988, August). Procrastination in the Workplace: Dispositional and Situational Determinants of Delay Behavior at Work. In *Academy of Management Proceedings*, *1*, 226-230. Briarcliff Manor, NY 10510: Academy of Management

Corkin, D. M., Shirley, L. Y., Wolters, C. A., & Wiesner, M. (2014). The role of the college classroom climate on academic procrastination. *Learning and Individual Differences*, *32*, 294-303.

Crowne, D.P., & Marlowe, D. (1964). *The approval motive*. New York: John Wiley & Sons.

Davidov, E., Meuleman, B., Cieciuch, J., Schmidt, P., & Billiet, J. (2014). Measurement equivalence in cross-national research. *Annual review of sociology*, *40*, 55-75.

Day, V., Mensink, D., & O'Sullivan, M. (2000). Patterns of academic procrastination. *Journal of College Reading and Learning*, *30*(2), 120-134.

Dewitte, S., & Schouwenburg, H. C. (2002). Procrastination, temptations, and incentives: The struggle between the present and the future in procrastinators and the punctual. *European Journal of personality*, *16*(6), 469-489.

Ellis, A., & Knaus, W. J. (1977). Overcoming procrastination: How to think and act rationally in spite of life's inevitable hassles. *New York: Institute for Rational Living*.

Fee, R. L., & Tangney, J. P. (2000). Procrastination: A means of avoiding shame or guilt?. *Journal of Social Behavior and Personality*, *15*(5), 167.

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*(5), 391-406.

Ferrari, J. R., & Emmons, R. A. (1995). Methods of procrastination and their relation to self-control and self-reinforcement: An exploratory study. *Journal of Social Behavior and Personality, 10(1),* 135.

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

Ferrari, J. R., & Patel, T. (2004). Social comparisons by procrastinators: Rating peers with similar or dissimilar delay tendencies. *Personality and individual Differences*, *37*(7), 1493-1501.

Ferrari, J. R., O'Callaghan, J., & Newbegin, I. (2005). Prevalence of Procrastination in the United States, United Kingdom, and Australia: Arousal and Avoidance Delays among Adults. *North American Journal of Psychology*, *7*(1).

Festinger, L. (1954). A theory of social comparison processes. *Human relations*, *7*(2), 117-140.

Flett, G. L., Blankstein, K. R., & Martin, T. R. (1995). Procrastination, negative self-evaluation, and depression: A review and preliminary model. In J. Ferrari, J. Johnson, & W. McCown (Eds.), *Procrastination and task avoidance: Theory, research, and treatment* (pp. 137–167). New York: Plenum Press.

Foster, G., & Frijters, P. (2010). Students' beliefs about peer effects. *Economics Letters*, *108*(3), 260-263.

Eisenkopf, G. (2009). Student selection and incentives. *Zeitschrift für Betriebswirtschaft*, *79*(5), 563-577.

Gaff, J. G., Crombag, H. F. M., & Chang, T. M. (1976). Environments for learning in a Dutch university. *Higher education*, *5*(3), 285-299.

Gafni, R., & Geri, N. (2010). Time management: Procrastination tendency in individual and collaborative tasks. *Interdisciplinary Journal of Information, Knowledge, and Management*, *5*(1), 15-125.

Gamst-Klaussen, T., Steel, P., & Svartdal, F. (2019). Procrastination and personal finances: Exploring the roles of planning and financial self-efficacy. *Frontiers in psychology*, *10*, 775.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*, 493-503.

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology, 38*, 69-119

Grunschel, C., Patrzek, J., & Fries, S. (2013). Exploring reasons and consequences of academic procrastination: An interview study. *European Journal of Psychology of Education*, *28*(3), 841-861.

Gustavson, D. E., Miyake, A., Hewitt, J. K., & Friedman, N. P. (2014). Genetic relations among procrastination, impulsivity, and goal-management ability: Implications for the evolutionary origin of procrastination. *Psychological Science*, *25*(6), 1178-1188.

Häfner, A., Oberst, V., & Stock, A. (2014). Avoiding procrastination through time management: An experimental intervention study. *Educational Studies*, *40*(3), 352-360.

Harriott, J., & Ferrari, J. R. (1996). Prevalence of procrastination among samples of adults. *Psychological reports*, *78*(2), 611-616.

Harris, N. N., & Sutton, R. I. (1983). Task procrastination in organizations: A framework for research. *Human Relations*, *36*(11), 987-995.

Hellsten, L. A. M., & Todd Rogers, W. (2009). Development and preliminary validation of the Time Management for Exercise Scale. *Measurement in Physical Education and Exercise Science*, *13*(1), 13-33.

Howell, A. J., Watson, D. C., Powell, R. A., & Buro, K. (2006). Academic procrastination: The pattern and correlates of behavioural postponement. *Personality and Individual Differences*, *40*(8), 1519-1530.

Job, V., Walton, G. M., Bernecker, K., & Dweck, C. S. (2015). Implicit theories about willpower predict self-regulation and grades in everyday life. *Journal of Personality and Social Psychology*, *108*(4), 637.

Kahn, Z. A. (2011). Procrastination in relation to self-efficacy in graduate students writing a doctoral dissertation. *Theses, Dissertations, and Projects. 555*.

Kankaraš, M., & Moors, G. (2010). Researching measurement equivalence in cross-cultural studies. *Psihologija*, *43*(2), 121-136.

Kantanis, T. (2000). The role of social transition in students': adjustment to the first-year of university. *Journal of Institutional Research*, *9*(1), 100-110.

Karas, D., & Spada, M. M. (2009). Brief cognitive-behavioural coaching for procrastination: a case series. *Coaching: An International Journal of Theory, Research and Practice*, *2*(1), 44-53.

Kim, K. R., & Seo, E. H. (2015). The relationship between procrastination and academic performance: A meta-analysis. *Personality and Individual Differences*, *82*, 26-33.

Klassen, R. M., Ang, R. P., Chong, W. H., Krawchuk, L. L., Huan, V. S., Wong, I. Y., & Yeo, L. S. (2010). Academic procrastination in two settings: Motivation correlates, behavioral patterns, and negative impact of procrastination in Canada and Singapore. *Applied Psychology*, *59*(3), 361-379.

Klassen, R. M., Krawchuk, L. L., & Rajani, S. (2008). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemporary Educational Psychology*, *33*(4), 915-931.

Klein, E. M., Beutel, M. E., Müller, K., Wölfling, K., Brähler, E., and Zenger, M. (2017). Assessing procrastination. Dimensionality and factorial invariance across sex and age of the short form of the general procrastination scale (GPS-K) in a representative German community sample. *Eur. J. Psychol.Assess.*

Klingsieck, K. B. (2013). Procrastination: When good things don't come to those who wait. *European Psychologist, 18 (1), 24–34.*

Klingsieck, K. B., & Fries, S. (2012). Allgemeine Prokrastination: Entwicklung und Validierung einer deutschsprachigen Kurzskala der General Procrastination Scale (Lay, 1986) [Procrastination: Development and validation of a German short scale of the General Procrastination Scale (Lay, 1986)]. *Diagnostica, 58,* 182–193.

Klingsieck, K. B., Grund, A., Schmid, S., & Fries, S. (2013). Why students procrastinate: A qualitative approach. *Journal of College Student Development*, *54*(4), 397-412.

König, C. J., & Kleinmann, M. (2004). Business before pleasure: no strategy for procrastinators?. *Personality and Individual Differences*, *37*(5), 1045-1057.

Kroese, F. M., De Ridder, D. T., Evers, C., & Adriaanse, M. A. (2014). Bedtime procrastination: introducing a new area of procrastination. *Frontiers in Psychology*, *5*, 611.

Lamwers, L. L., & Jazwinski, C. H. (1989). A comparison of three strategies to reduce student procrastination in PSI. *Teaching of Psychology*, *16*(1), 8-12.

Latham, G. P., & Locke, E. A. (2007). New developments in and directions for goal-setting research. *European Psychologist*, *12*(4), 290-300.

Lay, C. H. (1986). At last, my research article on procrastination. *Journal of research in personality*, *20*(4), 474-495.

Lay, C. H. (1992). Trait procrastination and the perception of person-task characteristics. *Journal of Social Behavior and Personality*, *7*(3), 483-494.

Lay, C. H., & Schouwenburg, H. C. (1993). Trait procrastination, time management, and academic behavior. *Journal of social Behavior and personality*, *8*(4), 647.

Lindblom-Ylänne, S., Saariaho, E., Inkinen, M., Haarala-Muhonen, A., & Hailikari, T. (2015). Academic procrastinators, strategic delayers and something betwixt and between: An interview study. *Frontline Learning Research*, *3*(2), 47-62.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting & task performance*. Prentice-Hall, Inc.

Lowe, H., & Cook, A. (2003). Mind the gap: are students prepared for higher education?. *Journal of further and higher education*, *27*(1), 53-76.

Lum, M. K. (1960). A comparison of under-and overachieving female college students. *Journal of Educational Psychology*, *51*(3), 109.

Mann, L. (1982). *Decision-making questionnaire*. Flinders University of South Australia *Unpublished scale*.

Mann, L., Burnett, P., Radford, M., & Ford, S. (1997). The Melbourne Decision Making Questionnaire: An instrument for measuring patterns for coping with decisional conflict. *Journal of Behavioral Decision Making*, *10*(1), 1-19.

McCown, B., Blake, I. K., & Keiser, R. (2012). Content analyses of the beliefs of academic procrastinators. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *30*(4), 213-222.

McCown, W., Johnson, J., & Petzel, T. (1989). Procrastination, a principal components analysis. *Personality and Individual Differences*, *10*(2), 197-202.

Mehrabian, A. (2000). Beyond IQ: Broad-based measurement of individual success potential or" emotional intelligence". *Genetic, Social, and General Psychology Monographs*, *126*(2), 133.

Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika*, *58*(4), 525-543.

Milgram, N. A., Sroloff, B., & Rosenbaum, M. (1988). The procrastination of everyday life. *Journal of Research in Personality*, *22*(2), 197-212.

Morris, E. K., Surber, C. F., & Bijou, S. W. (1978). Self-versus instructor-pacing: Achievement, evaluations, and retention. *Journal of Educational Psychology*, *70*(2), 224.

Neenan, M. (2008). Tackling procrastination: An REBT perspective for coaches. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *26*(1), 53-62.

Newman, F. L., Young, D. L., Ball, S. E., Smith, C. C., & Purtle, R. B. (1974). Initial attitude differences among successful, procrastinating, and "Withdrawn-from-Course" students in a personalized system of statistics instruction. *Journal for Research in Mathematics Education*, 105-113.

Nguyen, B., Steel, P., & Ferrari, J. R. (2013). Procrastination's Impact in the Workplace and the Workplace's Impact on Procrastination. *International Journal of Selection and Assessment*, *21*(4), 388-399.

Ozer, B. U., Demir, A., & Ferrari, J. R. (2013). Reducing academic procrastination through a group treatment program: A pilot study. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *31*(3), 127-135.

Paolacci, G., Chandler, J., & Ipeirotis, P. G. (2010). Running experiments on amazon mechanical turk. *Judgment and Decision making*, *5*(5), 411-419.

Pychyl, T. A., & Flett, G. L. (2012). Procrastination and self-regulatory failure: An introduction to the special issue. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *30*, 203–212.

Pychyl, T. A., Lee, J. M., Thibodeau, R., & Blunt, A. (2000). Five days of emotion: An experience sampling study of undergraduate student procrastination. *Journal of social Behavior and personality*, *15*(5), 239.

Pychyl, T. A., Morin, R. W., & Salmon, B. R. (2000). Procrastination and the planning fallacy: An examination of the study habits of university students. *Journal of Social Behavior and Personality*, *15*(5), 135.

Ramsden, P. (1997). The context of learning in academic departments. *The experience of learning*, *2*, 198-216.

Rebetez, M. M. L., Rochat, L., Gay, P., & Van der Linden, M. (2014). Validation of a French version of the Pure Procrastination Scale (PPS). *Comprehensive psychiatry*, *55*(6), 1442-1447.

Roberts, M. S., Fulton, M., & Semb, G. (1988). Self-pacing in a personalized psychology course: Letting students set the deadlines. *Teaching of Psychology*, *15*(2), 89-92.

Rothblum, E. D., Solomon, L. J., & Murakami, J. (1986). Affective, cognitive, and behavioral differences between high and low procrastinators. *Journal of counseling psychology*, *33*(4), 387.

Rozental, A., Bennett, S., Forsström, D., Ebert, D. D., Shafran, R., Andersson, G., & Carlbring, P. (2018). Targeting procrastination using psychological treatments: a systematic review and meta-analysis. *Frontiers in psychology*, *9*, 1588.

Rozental, A., & Carlbring, P. (2014). Understanding and treating procrastination: A review of a common self-regulatory failure. *Psychology*, *5*(13), 1488.

Rozental, A., Forsell, E., Svensson, A., Forsström, D., Andersson, G., & Carlbring, P. (2014). Psychometric evaluation of the Swedish version of the pure procrastination scale, the irrational procrastination scale, and the susceptibility to temptation scale in a clinical population. *BMC psychology*, *2*(1), 54.

Rozental, A., Forsell, E., Svensson, A., Andersson, G., & Carlbring, P. (2015). Internet-based cognitive—behavior therapy for procrastination: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *83*(4), 808.

Santella, A., (2018). *Soon: An Overdue History of Procrastination, from Leonardo and Darwin to You and Me*. Dey Street Books.

Schmitz, B., & Wiese, B. S. (2006). New perspectives for the evaluation of training sessions in self-regulated learning: Time-series analyses of diary data. *Contemporary educational psychology*, *31*(1), 64-96.

Schachter, S., Christenfeld, N., Ravina, B., & Bilous, F. (1991). Speech disfluency and the structure of knowledge. *Journal of Personality and Social Psychology*, *60*(3), 362.

Schraw, G., Wadkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. *Journal of Educational psychology*, *99*(1), 12.

Semb, G., Glick, D. M., & Spencer, R. E. (1979). Student withdrawals and delayed work patterns in self-paced psychology courses. *Teaching of psychology*, *6*(1), 23-25.

Sheeran, P., & Webb, T. L. (2016). The intention–behavior gap. *Social and personality psychology compass*, *10*(9), 503-518.

Sirois, F. M. (2007). "I'll look after my health, later": A replication and extension of the procrastination–health model with community-dwelling adults. *Personality and Individual Differences*, *43*(1), 15-26.

Sirois, F. M. (2014). Procrastination and stress: Exploring the role of self-compassion. *Self and Identity*, *13*(2), 128-145.

Sirois, F. M., & Pychyl, T. A. (2002, August). Academic procrastination: Costs to health and well-being. In *110th Annual Convention of the American Psychological Association, Chicago, Illinois*.

Sirois, F., & Pychyl, T. (2013). Procrastination and the priority of short-term mood regulation: Consequences for future self. *Social and personality psychology compass*, *7*(2), 115-127.
Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: Frequency and cognitive-behavioral correlates. *Journal of counseling psychology*, *31*(4), 503.
Sperber, A. D. (2004). Translation and validation of study instruments for cross-cultural research. *Gastroenterology*, *126*, 124-128.
Sperber, A. D., Devellis, R. F., & Boehlecke, B. (1994). Cross-cultural translation: methodology and validation. *Journal of cross-cultural psychology*, *25*(4), 501-524.
Stead, R., Shanahan, M. J., & Neufeld, R. W. (2010). "I'll go to therapy, eventually": Procrastination, stress and mental health. *Personality and Individual Differences*, *49*(3), 175-180.
Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological bulletin*, *133*(1), 65.
Steel, P. (2010). Arousal, avoidant and decisional procrastinators: Do they exist?. *Personality and Individual Differences*, *48*(8), 926-934.
Steel, P., & Ferrari, J. (2013). Sex, education and procrastination: An epidemiological study of procrastinators' characteristics from a global sample. *European Journal of Personality*, *27*(1), 51-58.
Steel, P., & Klingsieck, K. B. (2016). Academic procrastination: Psychological antecedents revisited. *Australian Psychologist*, *51*(1), 36-46.
Steel, P., & König, C. J. (2006). Integrating theories of motivation. *Academy of management review*, *31*(4), 889-913.
Steel, P., Svartdal, F., Thundiyil, T., & Brothen, T. (2018). Examining procrastination across multiple goal stages: a longitudinal study of temporal motivation theory. *Frontiers in psychology*, *9*, 327.
Stinebrickner, R., & Stinebrickner, T. R. (2006). What can be learned about peer effects using college roommates? Evidence from new survey data and students from disadvantaged backgrounds. *Journal of public Economics*, *90*(8-9), 1435-1454.
Stöber, J., & Joormann, J. (2001). Worry, procrastination, and perfectionism: Differentiating amount of worry, pathological worry, anxiety, and depression. *Cognitive therapy and research*, *25*(1), 49-60.
Strong, S. R., Wambach, C. A., Lopez, F. G., & Cooper, R. K. (1979). Motivational and equipping functions of interpretation in counseling. *Journal of Counseling Psychology*, *26*(2), 98.
Svartdal, F. (2017). Measuring procrastination: Psychometric properties of the Norwegian versions of the Irrational Procrastination Scale (IPS) and the Pure Procrastination Scale (PPS). *Scandinavian Journal of Educational Research*, *61*(1), 18-30.
Svartdal, F., Pfuhl, G., Nordby, K., Foschi, G., Klingsieck, K. B., Rozental, A., ... & Rębkowska, K. (2016). On the measurement of procrastination: comparing two scales in six European countries. *Frontiers in psychology*, *7*, 1307.
Svartdal, F., & Steel, P. (2017). Irrational delay revisited: examining five procrastination scales in a global sample. *Frontiers in psychology*, *8*, 1927.
Tice, D. M., & Baumeister, R. F. (1997). Longitudinal study of procrastination, performance, stress, and health: The costs and benefits of dawdling. *Psychological science*, *8*(6), 454-458.
Tice, D. M., & Bratslavsky, E. (2000). Giving in to feel good: The place of emotion regulation in the context of general self-control. *Psychological Inquiry*, *11*(3), 149-159.
Toker, B., & Avci, R. (2015). Effect of Cognitive-Behavioral-Theory-Based skill training on academic procrastination behaviors of university students. *Educational Sciences: Theory and Practice*, *15*(5), 1157-1168.
Tuckman, B. W. (1991). The development and concurrent validity of the procrastination scale. *Educational and psychological measurement*, *51*(2), 473-480.
Van der Meer, J., Jansen, E., & Torenbeek, M. (2010). 'It's almost a mindset that teachers need to change': first-year students' need to be inducted into time management. *Studies in Higher Education*, *35*(7), 777-791.
Van Eerde, W. (2000). Procrastination: Self-regulation in initiating aversive goals. *Applied Psychology*, *49*(3), 372-389.
Van Eerde, W. (2003). A meta-analytically derived nomological network of procrastination. *Personality and individual differences*, *35*(6), 1401-1418.
van Eerde, W., & Klingsieck, K. B. (2018). Overcoming procrastination? A meta-analysis of intervention studies. *Educational Research Review*, *25*, 73-85.
van Hooft, E. A., Born, M. P., Taris, T. W., van der Flier, H., & Blonk, R. W. (2005). Bridging the gap between intentions and behavior: Implementation intentions, action control, and procrastination. *Journal of Vocational Behavior*, *66*(2), 238-256.
Wang, S., Zhou, Y., Yu, S., Ran, L. W., Liu, X. P., & Chen, Y. F. (2017). Acceptance and commitment therapy and cognitive–behavioral therapy as treatments for academic procrastination: A randomized controlled group session. *Research on Social Work Practice*, *27*(1), 48-58.

Wäschle, K., Lachner, A., Stucke, B., Rey, S., Frömmel, C., & Nückles, M. (2014). Effects of visual feedback on medical students' procrastination within web-based planning and reflection protocols. *Computers in Human Behavior*, *41*, 120-136.

Wesp, R. (1986). Reducing procrastination through required course involvement. *Teaching of Psychology*, *13*(3), 128-130.

Wu, F., & Fan, W. (2017). Academic procrastination in linking motivation and achievement-related behaviours: A perspective of expectancy-value theory. *Educational Psychology*, *37*(6), 695-711.

Wu, H., Gui, D., Lin, W., Gu, R., Zhu, X., & Liu, X. (2016). The procrastinators want it now: behavioral and event-related potential evidence of the procrastination of intertemporal choices. *Brain and cognition*, *107*, 16-23.

Zercher, F., Schmidt, P., Cieciuch, J., & Davidov, E. (2015). The comparability of the universalism value over time and across countries in the European Social Survey: Exact vs. approximate measurement invariance. *Frontiers in Psychology*, *6*, 733.

Ziesat Jr, H. A., Rosenthal, T. L., & White, G. M. (1978). Behavioral self-control in treating procrastination of studying. *Psychological Reports*, *42*(1), 59-69.

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On the Measurement of Procrastination: Comparing Two Scales in Six European Countries

Frode Svartdal[1], Gerit Pfuhl[1], Kent Nordby[1], Gioel Foschi[1], Katrin B. Klingsieck[2], Alexander Rozental[3], Per Carlbring[3], Sari Lindblom-Ylänne[4] and Kaja Rębkowska[5]*

[1] Department of Psychology, University of Tromsø – the Arctic University of Norway, Tromsø, Norway, [2] Fakultät für Kulturwissenschaften, Fach Psychologie, Universität Paderborn, Paderborn, Germany, [3] Department of Psychology, Stockholm University, Stockholm, Sweden, [4] Centre for Research and Development of Higher Education, University of Helsinki, Helsinki, Finland, [5] Department of Psychology, University of Warszawa, Warszawa, Poland

Procrastination is a common problem, but defining and measuring it has been subject to some debate. This paper summarizes results from students and employees ($N = 2893$) in Finland, Germany, Italy, Norway, Poland, and Sweden using the *Pure Procrastination Scale* (PPS) and the *Irrational Procrastination Scale* (IPS; Steel, 2010), both assumed to measure unidimensional and closely related constructs. Confirmatory factor analyses indicated inadequate configural fit for the suggested one-factor model for PPS; however, acceptable fit was observed for a three-factor model corresponding to the three different scales the PPS is based on. Testing measurement invariance over countries and students–employees revealed configural but not strong or strict invariance, indicating that both instruments are somewhat sensitive to cultural differences. We conclude that the PPS and IPS are valid measures of procrastination, and that the PPS may be particularly useful in assessing cultural differences in unnecessary delay.

Keywords: procrastination, scale, validation, measurement, cross-cultural

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****Correspondence:***
Frode Svartdal
frode.svartdal@uit.no

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INTRODUCTION

When talking about goals, plans, intentions, and the intention-action-gap, it does not take long for the word procrastination to come up. "To voluntarily delay an intended course of action despite expecting to be worse off for the delay" (Steel, 2007, p. 66), is a common phenomenon that seems to be omnipresent in everyday life. It is widely studied in different disciplines of psychology. In fact, research on procrastination has somewhat exploded in the last decades, leading to a variety of approaches to defining and measuring it. This paper summarizes the results of a study that ran in parallel in six countries, in six different languages. The goal of the study was to compare the psychometric properties of two procrastination scales; examining factorial structure, internal consistency, item–test correlations, and convergent and discriminant validity, and to compare the scales across nations and between students and employees. Before going into the details of the study, we first characterize the phenomenon of procrastination and then present a short overview of the state of the art in measuring procrastination.

The different definitions of procrastination that circulate in the literature, all center on a few core aspects of the phenomenon (Klingsieck, 2013a). Of these, some pertain to the act being delayed: procrastination involves the delay of an overt or covert act that is necessary or of personal importance and where the start or completion was intended. The other aspects focus on the delay itself: it is voluntary and not imposed on oneself by external matters; it is unnecessary or irrational,

meaning that it is carried out despite being aware of its potential negative consequences; while also being accompanied by subjective discomfort or even negative consequences.

The occurrence of procrastination depends on personal and situational factors. On the one hand, procrastination relates to personality traits such as conscientiousness and impulsiveness (Steel, 2007). It also occurs more often in the context of mastery-goal orientation (Howell and Watson, 2007), and less in self-determined activities (Senécal et al., 2003). On the other hand, certain task characteristics and contextual factors bear a greater potential for procrastination than others, for example, high task complexity (Ackerman and Gross, 2005), and the absence of clear deadlines (Schraw et al., 2007). Also, procrastination often entails manifest negative consequences concerning objective well-being, for example, health-related or academic achievement-related consequences (Tice and Baumeister, 1997) and subjective well-being (Deniz, 2006; Klingsieck, 2013b). Research indicates that approximately one-fifth of the adult population regard themselves as having great difficulties initiating or completing tasks and commitments (Harriott and Ferrari, 1996) while at least half of the student population perceive procrastination as a recurrent and severe problem in their everyday life (Day et al., 2000). However, albeit experienced as distressing, these numbers do not necessarily represent a clinical condition (Rozental and Carlbring, 2014), suggesting that only a small proportion is in need of psychological treatment. Moreover, no systematic comparisons between non-student and student samples have been made regarding their degree and character of procrastination, warranting further investigation to obtain more reliable estimates and possible qualitative differences.

Measuring Procrastination

Although the concept of procrastination may seem quite straightforward, deriving valid methods for determining the degree of procrastination have proven to be quite complicated (Steel, 2010). Research has primarily relied on various self-report measures believed to entail a general trait or feature defined as procrastination, but often stemming from different theoretical frameworks (Rozental et al., 2014). An early attempt to devise an instrument was, for instance, the Decisional Procrastination Questionnaire (DPQ; Mann, 1982, unpublished; Mann et al., 1997), comprised of five items that capture the occurrence of putting off decisions, e.g., "I waste a lot of time on trivial matters before getting to the final decision" (item 9). Likewise, Schouwenburg (1995) introduced the Academic Procrastination State Inventory (APSI), having 23 items supposed to assess procrastination on a variety of study related activities, e.g., "Forgot to prepare things for studying" (item 11). Meanwhile, other instruments have also been developed, believed to evaluate the everyday tendency to procrastinate, such as the General Procrastination Scale (GPS; Lay, 1986), consisting of 20 items, e.g., "I generally delay before starting on work I have to do" (item 9), the Adult Inventory of Procrastination (AIP; McCown et al., 1989), encompassing 15 items, e.g., "I don't get things done on time" (item 5), and the Aitken Procrastination Inventory (API; Aitken, 1982), containing 19 items, e.g., "Even when I know a job needs to be done, I never want to start it right away" (item 3). Given the moderate correlation between the GPS and AIP, however, it was assumed that they might involve different types of procrastination, arousal and avoidance (Ferrari, 1992), in line with the widespread notion of procrastination being caused by either a desire to seek thrills or experiencing performance anxiety (Klingsieck, 2013a). Steel (2010), however, performed a meta-analysis on prior studies of the instruments, as well as exploratory and confirmatory factor analysis (CFA) on data from a new sample responding to both scales, finding little evidence for this division. Instead, the results indicated that procrastination is probably more accurately conceived of as a unidimensional construct, general procrastination, accounting for a large degree of the variance, while some items were either unrelated to the definition of procrastination as a voluntary delay of an intended course of action, or loaded on different factors, in particular, those associated with being in a rush or being prompt.

Hence, Steel (2010) introduced a novel instrument, based on existing scales but consisting of only the 12 items that were directly related to general procrastination according to the factor analyses, the Pure Procrastination Scale (PPS). This scale was based on 12 items from three of the established procrastination scales discussed, the DPQ (PPS items 1–3), GPS (PPS items 4–8), and AIP (PPS items 9–12; Steel, 2010). The word "pure" reflects the fact that it has improved validity over previous instruments. The PPS is a self-report measure using a 5-point Likert scale (1–5), with higher scores indicating greater agreement. All items are consistent with procrastination, e.g., "In preparation for some deadlines, I often waste time by doing other things" (item 4). Furthermore, in line with the perception of procrastination as an irrational delay, Steel (2010) also introduced an additional instrument comprised of nine items named the Irrational Procrastination Scale (IPS), arguing that the PPS and the IPS should be closely related and thus be able to share validation efforts. The IPS is also a self-report measure using a 5-point Likert scale (1–5), with higher scores reflecting greater procrastination, e.g., "I put things off so long that my well-being or efficiency unnecessarily suffers" (item 1), and with the addition of three reversed items that are inconsistent with procrastination (items 2, 6, and 9). Moreover, although not directly assessing the same underlying construct, an instrument of impulsiveness and the tendency to give in to temptations was also proposed after being tested in relation to procrastination, the Susceptibility to Temptation Scale (STS; Steel, 2010). The STS is comprised of 11 items assessed on a 5-point Likert scale (1–5), with higher scores suggesting a greater tendency to become distracted by surrounding diversions, e.g., "When a temptation is right before me, the craving can be intense" (item 9).

Using a sample of 4169 individuals recruited via the Internet from English-speaking individuals across the globe, these instruments were shown to have high internal consistencies (PPS Cronbach's $\alpha = 0.92$, IPS $\alpha = 0.91$, and STS $\alpha = 0.89$), as well as convergent and divergent validity with other instruments of procrastination and one of well-being, the Satisfaction With Life Scale (SWLS; Diener et al., 1985), suggesting that the PPS and the IPS can be used in parallel. The STS exhibited a large average correlation with PPS and IPS, $r = 0.69$ (Steel, 2010), indicating

that impulsiveness is strongly related to dilatory behavior, in accordance with prior findings.

Instruments such as the PPS and the IPS should in other words be more suitable in terms of determining the degree of procrastination given their increased convergent and divergent validity and improved correlations with other corresponding concepts (Klingsieck, 2013a). Also, the STS may be a useful instrument for examining impulsiveness and the tendency to give in to temptations, which, in turn, often results in procrastination. However, since their development and initial testing by Steel (2010), few attempts have been made to establish the properties of these instruments in other languages than English, as well as in relation to more diverse samples. Steel and Ferrari (2013) administered the IPS to a sample that was recruited via the Internet, but included only English-speaking individuals. Some or all of the instruments have been assessed in French (Rebetez et al., 2014), Swedish (Rozental et al., 2014), and Norwegian (Svartdal, 2015), but the results were restricted to treatment-seeking individuals, students, and adults, without systematic comparisons between samples, as well as obtaining somewhat different results between nations regarding factor structures of the scales. The French evaluation indicated that the PPS should be comprised of 11 instead of 12 items, suggesting a two-factor solution, with items 1–8 and items 9–11 loading on different constructs, "voluntary delay" vs. "observed delay" (Rebetez et al., 2014). The Swedish investigation, using a clinical sample (individuals being recruited for a clinical trial of internet-based cognitive behavior therapy for procrastination), obtained a two-factor solution for the PPS, one factor being more related to delaying decision making, not meeting deadlines, and missing appointments (PPS items 1–3 and 9–12), while the other was associated with starting late, lagging behind, and wasting time (items 4–8). In addition, the Swedish version of the PPS dropped the word "money" from item 12 and replaced it with the much broader notion "has cost me much." Meanwhile, the IPS was found to encompass two factors, with the second factor involving only those items that were scored in reverse (items 2, 6, and 9), possibly reflecting a methodological artifact, while the STS only included one factor measuring susceptibility to temptation (Rozental et al., 2014). Regarding the Norwegian assessment, both the PPS and the IPS indicated one-factor solutions comparable to that of Steel (2010), albeit using a similar revision of item 12 for the PPS as the Swedish translation (Svartdal, 2015).

The Current Study

To examine the utility of the PPS, the IPS, and the STS in a number of languages, as well as with regard to a more heterogeneous sample, the current study distributed the instruments to students and working individuals in six nations: Finland, Germany, Italy, Norway, Poland, and Sweden. The first objective was to conduct an evaluation of the different translations of the instruments using CFA based on initial findings by Steel (2010) as well as later results (Rebetez et al., 2014; Rozental et al., 2014; Svartdal, 2015). This evaluation addressed the factor structures of the instruments, and the PPS in particular. As noted, three different factor structures have been suggested for this scale. We argue that a fourth model should be examined. The PPS is based on items from three established procrastination scales, DPQ, GPS, and AIP. Examination of the DPQ and AIP items contained in the PPS indicate that they do not fit well to a definition of procrastination as irrational delay in implementation of intended action (Steel, 2007). Specifically, PPS items 1 and 3 address delay in decision (e.g., "I delay making decisions until it's too late"; DPQ4), whereas PPS items 9–12 focus on deadlines and timeliness. For example, PPS item 9 "I find myself running out of time" (originally AIP10) may measure busyness and not procrastination *per se*, as noted by Steel (2010, p. 930) in discussing AIP items that were not included in the PPS. In effect, two of three DPQ items and all AIP items included in the PPS may not optimally measure the intended construct – "to voluntarily delay an intended course of action despite expecting to be worse off for the delay" (Steel, 2007, p. 66). Hence, evaluation of the PPS should address a fourth model for factor structure corresponding to three related but still different facets of delay: decisional delay, irrational delay of action, and delay in meeting deadlines and timeliness. The configural models of the various instruments were tested on the whole sample, and then for individual countries and the employee–student subgroups.

A second aim of the present study was to assess measurement equivalence over the participating countries. A few studies have compared procrastination scales between different English-speaking countries (e.g., Mann et al., 1998; Klassen et al., 2010), assuming but not assessing measurement equivalence. However, although construct (configural) equivalence as tested by CFA assures that the same construct is being measured by a given set of items, configural equivalence does not guarantee that scale means are comparable over nations or subgroups. For such comparison to be meaningful, weak (metric) as well as strong (scalar) equivalence must be present (Kankaraš and Moors, 2010; Brown, 2015). Metric equivalence requires that factor loadings for items in a scale are comparable across groups, and indicates that the construct has the same meaning over countries and subgroups; scalar equivalence requires that the scales are calibrated in the same way across nations and subgroups, i.e., that 1-unit increase in the latent construct has the same meaning over groups. Obviously, these requirements are threatened by cultural and subgroup differences in construct understanding, item biases, measurement errors, and method biases (Podsakoff et al., 2003; van Herk et al., 2004). Given satisfactory configural baseline models of the instruments, measurement equivalence can be evaluated by multigroup CFA (MG CFA) in increasingly restrictive steps, i.e., configural equivalence, structural (weak) equivalence, and measurement (strong) equivalence, and finally strict equivalence (Wu et al., 2007; Byrne, 2008; Brown, 2015; Kline, 2016).

Limited evidence is available to make sound predictions about equivalence over the participating countries. However, a number of observations indicate that procrastination instruments may be more vulnerable to cultural differences than is often assumed. For example, cross-cultural research on decisional procrastination

(Mann et al., 1998) indicates substantial variations even between comparable cultures (i.e., USA, Australia, New Zealand). As decisional and behavioral procrastination are closely related (Mann, 2016), such differences may translate into cross-national differences in overall procrastination scores. Further, the six countries participating in this investigation, although all western, differ substantially in planning behaviors. For example, one study (Reinecke et al., 2013) found participants from Italy, Finland, and Sweden to plan ahead much less compared to those from Germany. Also, as procrastination is closely related to impulsiveness (Steel, 2007), cross-country variations in short-term discounting (Wang et al., 2016) speak for differences in impulsiveness and hence in procrastination over countries. In the Wang et al.'s (2016) study, 89% of German participants expressed a preference for delay in exchange for a bigger reward later, whereas the corresponding percentage for Italians was 44. Finally, gender differences (Steel and Ferrari, 2013) and differences between students and employees (Hicks and Storey, 2015) indicate that measurement equivalence over countries and subgroups may be uncertain. Overall, although the concept of procrastination is familiar in all countries participating in this study, thus satisfying a fundamental requirement of conceptual equivalence, we assume that the procrastination scales included in this study may be sensitive to cultural and subgroup differences.

MATERIALS AND METHODS

Participants

A total of 2,893 students and working individuals from six countries; Finland, Germany, Italy, Norway, Poland, and Sweden participated. Participants were invited in lectures, by email invitations at institutes and institutions, and through social media. No incentives were offered for participation. All countries contributed with student samples > 200, Germany, Norway, and Sweden also contributed with employee samples >200; employee samples from the remaining countries are included in most analyses even if quite small (e.g., Poland and Italy). **Table 1** summarizes the number of respondents and subgroups for each country.

Translating the PPS, IPS, and STS in Six Different Languages

Translations were made for the following languages; Finnish, German, Italian, and Polish, with the addition of the previously validated versions of PPS, IPS, and STS in Swedish and Norwegian. All of the translations were derived from the English instruments, originally developed by Steel (2010). For more information about the Swedish and Norwegian translations, please refer to Rozental et al. (2014) and Svartdal (2015). The translation of the other four language versions followed these four steps of translation and back translation: first, two persons (either the researchers themselves or English language and literature students) translated the English version into the target language. A few items had already been translated as part of other scales (e.g., the GPS, Lay, 1986). If these translations had already been published, these items were used instead of a new translation. Second, a third person fluent in both languages translated all items back into English. Third, this version was compared to the original version checking for meaning, content, and coherence. In this step, all three persons were involved. Fourth, the new language versions were discussed with the whole research team in order to check whether all items were interpreted in a similar manner by different persons.

Instruments

The PPS consists of 12 items (Steel, 2010), all consistent with procrastination and rated on a 5-point Likert scale (1–5) with higher scores indicating greater agreement. Apart from its original validation, different translations of the PPS have since then obtained comparable results on samples of students, adults, as well as treatment-seeking individuals, $\alpha = 0.78$–0.93 (Rebetez et al., 2014; Rozental et al., 2014; Svartdal, 2015). The IPS (Steel, 2010) features nine items, of which three are reversed and thus inconsistent with procrastination. Items are rated on a 5-point Likert scale, with higher scores (after reversal of the three procrastination-inconsistent items) indicating higher degree of procrastination. The Norwegian translation demonstrated good internal consistency, $\alpha = 0.85$–0.93, and a high correlation with the PPS, $r = 0.86$ (Svartdal, 2015); the Swedish translation indicated somewhat lower values, $\alpha = 0.76$, and $r = 0.79$ (Rozental et al., 2014). In terms of the STS, it differs somewhat from the other instruments as it is comprised of 11 items aimed to evaluate a single factor, susceptibility to temptations, or, impulsiveness, rather than procrastination *per se* (Steel, 2010). Items are rated on a Likert scale (1–5), with higher scores indicating higher impulsiveness. Impulsiveness as a personality trait has been found to be associated with dilatory behavior, $r = 0.41$ (Steel, 2007), suggesting that there is a close link between impulsiveness and procrastination. The Swedish translation of the STS achieved comparable results, $\alpha = 0.87$, albeit with smaller correlations, $r = 0.32$–0.44, or, 0.39–0.53 when correcting for attenuation due to unreliability (Rozental et al., 2014). The Norwegian translation closely matched the original results (Steel, 2010), $\alpha = 0.87$ and IPS-STS correlation $r = 0.71$.

Translated versions of the SWLS (Diener et al., 1985) were distributed with the instruments on procrastination. The SWLS consists of five items aimed to capture the subjective experience of global life satisfaction, e.g., "I am satisfied with my life" (item 3). The SWLS is a self-report measure using a 7-point Likert scale (1–7), with higher scores related to higher satisfaction with life. The SWLS was originally administered to samples of students and the elderly, with good internal consistency, $\alpha = 0.87$, as well as a 2-month test–retest correlation coefficient of 0.82 (Diener et al., 1985). Subsequent investigations have obtained similar results, $\alpha = 0.79$–0.89, with varying test–retest reliabilities depending on the time span, e.g., 0.51 for 5 years and 0.81 for 1 month (Pavot and Diener, 2008). The SWLS is available in a number of languages, including those used in the current study. In the present study, the SWLS yielded an overall internal consistency of $\alpha = 0.88$, ranging from $\alpha = 0.84$ (Italy) to 0.89 (Finland) in the individual countries.

TABLE 1 | Number of participants, students and employees.

	Total no. of participants	Students (females/males)	Students' age, *M* (*SD*)	Employees (females/males)	Employees' age, *M* (*SD*)
Finland	731	667 (572/95)	26.23 (6.93)	122 (100/22)	34.28 (11.88)
Germany	401	200 (153/47)	23.43 (4.18)	201 (148/53)	39.45 (10.40)
Italy	306	267 (211/56)	20.14 (2.52)	39 (31/8)	34.92 (8.21)
Norway	518	287 (191/96)	24.19 (5.95)	230 (170/60)	38.18 (10.67)
Poland	382	318 (257/61)	21.13 (2.35)	61 (58/3)	25.67 (4.88)
Sweden	555	251 (196/55)	26.73 (7.63)	302 (244/58)	39.45 (11.20)
Overall	2893	1990 (1580/410)	24.03 (6.13)	955 (751/204)	37.44 (11.13)

Ethics

The project of which the current study is part received ethical approval from the Regional Ethical Board in Tromsø, Norway (REK nord 2014/2313).

Procedure

Data collection was performed over 2 months using an online survey system[1]. Participants were directed to a welcome web page, allowing them to select their native language introduction page. This page explained the purpose of the study, and that participation was anonymous and voluntary. The page also provided contact information to the country research site. Participants agreed to participate by actively pressing a start survey button. Once the survey was started, items on a given page had to be rated before proceeding to the next page. Mean completion time of the survey was 11 min.

Statistical Analyses

Prior to analysis, all scales were examined for multivariate normality, and in particular, multivariate kurtosis which is known to be detrimental to parameter estimation in SEM (Byrne, 2008). Non-normality was apparent in each scale within each country according to the Mardia skewness and kurtosis tests. Hence, we used the Satorra–Bentler scaled chi-square statistic that adjusts for non-normality (Satorra and Bentler, 2001). The PPS, IPS, and STS were subjected to CFA, using the SEM module in STATA 14.1[2]. Initially, we evaluated configural fits to the suggested models in the complete sample as well as in the subsamples. Criteria to determine configural fit included the root mean square error of approximation (RMSEA), the Bentler comparative fit index (CFI), the goodness-of-fit index, and the standardized root mean square residual (SRMR; Byrne, 2001). In determining acceptable goodness of fit, we adopted the standard criteria of RMSEA < 0.08, CFI values in the 0.90–1.00 range, and SRMR < 0.08.

Next, to assess measurement invariance over countries and subgroups, we performed MG CFAs in R[3] using the lavaan package (Rosseel, 2012; Hirschfeld and von Brachel, 2014). None of baseline models needed further adjustment although we noted a less good fit for the Finnish sample compared to the other countries. Measurement invariance was tested in four steps with the chi-square difference test between each successive step (Brown, 2015). In addition, the CFI differences between the models were examined. Cheung and Rensvold (2002) suggested that CFI differences should not exceed 0.01. The first step examined configural invariance across groups (equal form), the second step examined metric invariance (equal loadings), the third step examined scalar or strong equivalence (equal intercepts); finally, the fourth step examined strict invariance (equality of residual errors).

We also computed descriptive statistics for the IPS, PPS, STS, and SWLS for each participating country and for the two subgroups, employees and students. In addition, internal consistency (Cronbach's α) of the respective scales and item-total correlations for each scale were computed, as well as correlations between scales to assess convergent and divergent validity.

RESULTS AND DISCUSSION

Factor Structures of IPS, PPS, and STS

Pure Procrastination Scale

Three factor models have been suggested for the PPS: a one-factor model (Steel, 2010), a two-factor model with PPS items 1–8 ("voluntary delay") and items 9–11 ("observed delay"), ignoring item 12 (Rebetez et al., 2014), and a two-factor model with items 4–8 (starting late, lagging behind, and wasting time on other things) and items 1–3 and 9–12 (focusing on delayed decision making, not meeting deadlines, and missing appointments; Rozental et al., 2014). Given the origin of the PPS items (see above), a three-factor solution corresponding to these different aspects was scrutinized as well.

As seen in **Table 2**, the first three models, and in particular, the one-factor model (Steel, 2010), did not demonstrate acceptable fit. On the other hand, the three-factor structure model for PPS in line with the origin of the items comprising it demonstrated an acceptable fit. Fit indices under this model for individual nations were acceptable for all nations except Finland. As the original one-factor model and the suggested three-factor models are nested, we performed chi-squared difference tests to test the null hypothesis of no difference between the models. The Satorra–Bentler χ^2 change for the complete sample (1311.93, $df = 2$) was significant, $p < 0.01$, as were the changes within each country. CFI difference was 0.089. This indicates that a

[1] www.Qualtrics.com

[2] www.stata.com

[3] www.r-project.org

TABLE 2 | PPS, CFA results for four suggested factor solutions.

	S_B scaled χ^2	*df*	RMSEA_SB	CFI	SRMR
One-factor (Steel)	2060.11	54	0.113	0.866	0.059
Two-factor (Rebetez)	1083.65	43	0.092	0.925	0.049
Two-factor (Rozental)	1464.30	53	0.096	0.906	0.048
Three-factor model	748.18	51	0.069	0.955	0.037
Employees	186.33	51	0.053	0.974	0.028
Students	576.39	51	0.073	0.945	0.043
Male	153.86	51	0.058	0.965	0.037
Female	656.82	51	0.072	0.953	0.039
Sweden	131.52	51	0.053	0.965	0.033
Finland	385.05	51	0.095	0.929	0.060
Norway	203.12	51	0.076	0.946	0.047
Germany	135.34	51	0.064	0.959	0.042
Italy	106.23	51	0.060	0.958	0.048
Poland	96.26	51	0.048	0.979	0.031

χ^2 *and RMSEA are Satorra–Bentler scaled.*

three-factor model of PPS is preferable to the original one-factor model. A corresponding analysis for the difference between the two-factor models and the three-factor model rendered similar results.

Irrational Procrastination Scale

The IPS was originally suggested to conform to a one-factor construct (Steel, 2010). Later, Rozental et al. (2014) proposed a two-factor solution, with items 2, 6, and 9 (all reversed in the scale) loading on a different factor compared to the other items. The results are shown in **Table 3**. Both models demonstrated acceptable fit, both on the complete sample and on the student–employee subsamples. Results from individual nations indicated acceptable fit for the one-factor model except for Finland and Sweden. Schmitt and Stults (1985) warned that reversed items may load on a separate factor due to inattentiveness, in the present case that some participants fail to detect the reversed meaning of items 2, 6, and 9. Rerunning the analyses excluding participants demonstrating inattentiveness did not alter the conclusions reported in **Table 3**.[4]

Susceptibility to Temptation Scale

STS is assumed to measure a single construct (Steel, 2010). The CFA indicated an acceptable fit with the complete sample, RMSEA_SB = 0.078, CFI_SB = 0.931, and SRMR = 0.037. Similar results were observed for the student and employee subsamples.

Satisfaction With Life Scale

For SWLS, the CFA indicated a good fit with for the complete sample, RMSEA_SB = 0.046, CFI_SB = 0.995, and SRMR = 0.013.

In summary, these data suggest a three-factor structure for the PPS, with PPS items 1–3 focusing on decisional delay, items 4–8 measuring "irrational delay" in behavior, and items 9–12 measuring delay in meeting deadlines and timeliness. IPS seems to measure a single construct, "irrational delay," although it should be noted that the alternative model without reversed items demonstrated comparable fit indices. STS indicated support for the one-factor solution.

Equivalence Over Countries and Subgroups

In assessing invariance over countries and subgroups, the three-factor model of PPS, and one-factor models of IPS and STS, were examined. For each instrument, invariance in four increasingly restricted steps were tested (i.e., configural, loadings, intercepts, and means).

Pure Procrastination Scale

For PPS, configural invariance across countries was observed, S_B $\chi^2 = 1239.8$, $df = 306$, RMSEA_SB = 0.080, CFI_SB = 0.951. Comparing countries pairwise yielded only one weak invariance (between Sweden and Italy); all other pairwise comparisons indicated configural invariance only. Notably, in all pairs the poorest fit was observed for items 9–12 (SE from 0.08 to 0.13). Next, we compared the employee to the student sample. Here we found weak invariance (RMSEA_SB = 0.071, CFI_SB = 0.955, difference to structural invariance deltaCFI = 0, deltaRMSEA = 0.003). Again, a closer look at the fits indicated the largest deviation among the two groups on items 9–12 (SE ranging from 0.053 to 0.057). Finally, we also compared females and males. Here we found minor loss of fits from configural, to weak, to strong, to strict invariance (structural

[4]To assess inattentiveness, we calculated a difference score between the mean of the procrastination-consistent IPS items and the reversed items. Including participants with <5 on this index (corresponding to a mean deviation of 1.67 per reversed item), CFAs still demonstrated acceptable fits for the one-factor model (S_B $\chi^2 = 390.55$, $df = 27$, RMSEA_SB = 0.070, CFI_SB = 0.97, SRMR = 0.025) as well as for the two-factor model (S_B $\chi^2 = 378.66$, $df = 26$, RMSEA_SB = 0.071, CFI_SB = 0.97, SRMR = 0.025). Similarly, a comparison of the two models with and without a common latent factor (Podsakoff et al., 2003, p. 168) indicated a negligible method effect.

TABLE 3 | IPS, CFA results for two suggested factor solution.

	S_B scaled χ^2	*df*	RMSEA_SB	CFI	SRMR
One-factor (Steel)	523.71	27	0.080	0.958	0.032
Employees	182.89	27	0.078	0.964	0.032
Students	362.39	27	0.080	0.958	0.032
Females (2285)	493.84	27	0.087	0.953	0.034
Males (600)	78.61	27	0.056	0.976	0.028
Sweden	158.70	27	0.101	0.949	0.038
Finland	245.05	27	0.111	0.945	0.037
Norway	95.91	27	0.074	0.972	0.031
Germany	73.00	27	0.073	0.967	0.037
Italy	65.97	27	0.069	0.953	0.038
Poland	73.07	27	0.067	0.967	0.032
Two-factor (Rozental)	385.41	26	0.069	0.970	0.025
Sweden	125.34	26	0.083	0.961	0.031
Finland	206.40	26	0.098	0.955	0.033
Norway	71.85	26	0.058	0.982	0.024
Germany	57.55	26	0.055	0.975	0.031
Italy	54.36	26	0.062	0.965	0.034
Poland	62.62	26	0.061	0.977	0.029

χ^2 *and RMSEA are Satorra–Bentler scaled.*

RMSEA_SB = 0.076, CFI_SB = 0.953, strict RMSEA_SB = 0.071, CFI_SB = 0.951).

Irrational Procrastination Scale

The one factor model indicated structural invariance across the six countries, RMSEA_SB = 0.09, CFI_SB = 0.955. There was a weak invariance between Sweden and Poland, and between Germany and Italy, otherwise only structural invariance among the pairs of countries was observed. Items 3 and 9 had poorest fit across these pairwise comparisons. Next, we compared the employee to the student sample. Here, weak invariance was observed (RMSEA_SB = 0.08, CFI_SB = 0.957, difference to structural invariance deltaCFI = 0, deltaRMSEA = 0.005). Item 3 had the least fit (SE = 0.041). Finally, we also compared females and males. Here we found minor loss of fits from configural, to weak, to strong, and to strict invariance (maximal deltaCFI is 0.001), i.e., structural RMSEA_SB = 0.088, CFI_SB = 0.956, strict RMSEA_SB = 0.079, CFI_SB = 0.953.

Susceptibility to Temptation Scale

The one factor model yielded structural invariance across the six countries (RMSEA_SB = 0.091, CFI_SB = 0.933). There was weak invariance for the pair Sweden–Italy, else only structural invariance was found among the pairwise comparisons. The items with lowest fits varied and no pattern was found. Next, we compared the employee to the student sample. Here, we found weak invariance (RMSEA_SB = 0.083, CFI_SB = 0.929, difference to structural invariance deltaCFI = 0.001, deltaRMSEA = 0.004). Item 11 had the least fit (SE 0.041). Finally, we also compared females and males. Here we found only weak invariance, i.e., structural RMSEA_SB = 0.088, CFI_SB = 0.931, weak RMSEA_SB = 0.083, CFI_SB = 0.931.

Overall, these cross-cultural and group comparisons indicate that the procrastination instruments demonstrated the basic requirement for measurement invariance over countries and subgroups, i.e., configural invariance. For sex, strong invariance was observed both for PPS and IPS. As full scalar invariance is rarely observed in practice (e.g., Zercher et al., 2015), the lack of it need not imply that the scales cannot be used in different countries. However, an important implication is that comparisons and interpretations of mean differences across nations and groups cannot be done meaningfully. Note that poorest fit was observed on PPS items 9–12, indicating that these items are particularly sensitive to cultural variation.

Relation between the Two Procrastination Scales

As the PPS and IPS attempt to measure the same construct using the same rating scale (Steel, 2010), procrastination scores from the two instruments should yield roughly equivalent scores. However, studies comparing these scales within language groups have consistently reported a high correlation between them but a considerable difference in mean scores (**Table 5**, Steel, 2010; Rozental et al., 2014; Svartdal, 2015) with lower PPS scores compared to IPS scores in the same subjects. As is seen in **Table 4**, PPS means in the individual countries were consistently lower compared to IPS means. Given the suggested three-factor solution for PPS, PPS item 4–8 means should correspond quite well to IPS. This is seen in **Table 4**. **Table 5** summarizes the Cronbach's alphas and correlations between the scales and scale parts. Note that PPS items 4–8 correlate highly with PPS and IPS in all countries (r = 0.91–0.94, and 0.78–0.87, respectively). Hence, PPS items 4–8 achieve three purposes: they measure procrastination as well as the complete PPS, they correlate similarly with IPS, and they render a mean procrastination score quite comparable to IPS in all participating countries. In

TABLE 4 | Means and standard deviations for PPS, PPS items 4–8, IPS, and STS for the participating countries.

	PPS	PPS 4–8	IPS	STS
Sweden	2.48 (0.73)	2.68 (0.90)	2.91 (0.80)	2.72 (0.77)
Finland	2.66 (0.74)	2.77 (0.88)	2.99 (0.79)	2.71 (0.72)
Norway	2.50 (0.78)	2.82 (0.98)	2.99 (0.79)	2.73 (0.74)
Germany	2.33 (0.77)	2.68 (0.99)	2.79 (0.78)	2.60 (0.79)
Italy	2.62 (0.67)	2.77 (0.86)	2.68 (0.65)	3.03 (0.59)
Poland	2.82 (0.81)	3.11 (0.99)	3.22 (0.81)	2.82 (0.72)

TABLE 5 | Cronbach's alphas and correlations (ranges over countries), PPS, IPS, PPS three-factor.

	Cronbach's α	PPS	IPS	PPS 1–3	PPS 4–8
1. PPS	0.89–0.93				
2. IPS	0.85–0.93	0.79–0.87			
3. PPS 1–3	0.75–0.84	0.79–0.83	0.61–0.69		
4. PPS 4–8	0.88–0.93	0.91–0.94	0.79–0.87	0.63–0.71	
5. PPS 9–12	0.71–0.80	0.74–0.87	0.50–0.71	0.50–0.61	0.47–0.70

contrast, the correlations between these scales and PPS items 9–12 are considerably lower and vary substantially between countries.

Sex Differences

Overall, men demonstrated higher procrastination scores than women, but only marginally so. For example, the IPS mean scores were 2.91 vs. 3.04 for the two sexes, $F(1,2883) = 11.703$, $p = 0.000$, $\eta^2 = 0.004$. This difference was stable across countries except for Finland and Poland, where no sex differences appeared. For the PPS subscales, an overall sex difference appeared only for PPS items 4–8, $F(1,2883) = 6.31$, $p = 0.012$, $\eta^2 = 0.002$. This was seen over all countries except for Norway, where men had higher scores on all three subscales compared to women.

Age

Procrastination correlates weakly and negatively with age (Steel and Ferrari, 2013), and this was observed in the present data as well. The correlation between age and IPS was generally negative and in the range $r = -0.02$ (Poland) to $r = -0.23$ (Norway). These correlations were lower or absent in students, $r = 0.00$ (IPS), higher in the employment group, $r = -0.17$ and $r = -0.18$, reflecting a restriction of range in the student group.

Single vs. in a Relationship

Single individuals tended to procrastinate more compared to those married/in a relationship as measured both by the PPS and the IPS. This difference was stable in all countries except Finland, where no difference was observed, $F(1,2874) = 1.756$.

Education

Except for Norway and Poland, participants with college/university education tended to demonstrate higher procrastination scores compared to participants with high school education.

Procrastination, Impulsiveness, and Wellbeing

As expected, the STS correlated highly with the procrastination scales and moderately negatively with the SWLS, indicating convergent and divergent validity. Within each country, correlations between the STS and IPS ranged between $r = 0.59$ and 0.69, whereas the correlation between STS and SWLS ranged between $r = -0.25$ and -0.40.

GENERAL DISCUSSION

The purpose of the present study was twofold. First, using CFA, we evaluated the different translations of two well-established procrastination scales, the PPS and IPS (Steel, 2010) in order to assess their factor structures. Second, using MG CFA we compared the scales across countries and student vs. employee subgroups to assess measurement invariance. The main findings can be summarized as follows: (1) The PPS was found to conform to a three-factor solution corresponding to three aspects of delay, i.e., decisional, behavioral, and timeliness.[5] (2) The middle part of the PPS scale (items 4–8) seems to address "irrational delay" in much the same way as does the IPS. (3) PPS items 9–12, all related to timeliness, seemed to be particularly sensitive to cultural and subgroup differences. (4) Overall, within-country comparisons confirmed previous findings that men procrastinate more than women, that students procrastinate more than employees do, and that single procrastinate more than individuals in a relationship, but even here cultural differences were apparent.

In effect, reliable and valid translations of the PPS and IPS can now be used in studies on procrastination, hopefully propelling

[5]The findings regarding the PPS three-factor structure are supported by independent data sets from published studies by Rebetez et al. (2014) and Rozental et al. (2014), who kindly provided us with data or analyses. In addition, Steel provided extensive data that support the three-factor PPS structure (Svartdal and Steel, in preparation).

research on cultural differences concerning procrastination that have been scarce in the literature. When implementing the PPS, however, it can be useful to bear in mind that items 9–12, all measuring timeliness, seem to be particularly sensitive to cultural differences. The six countries participating in this study differ markedly on Hofstede's dimensions[6] as well as in the dimensions measured in the World Value Survey (e.g., WVS wave 6). Notably, the six countries differ in individualism, which correlates with planning ahead (Reinecke et al., 2013). Finland, Germany, Norway, and Sweden are extensive users of scheduling tools whereas this is less prominent for Italy and Poland, and Italy was found to plan least ahead and Germany most (Reinecke et al., 2013). As such the individualism score of a country may influence the interpretation of the decisional delay items and also the timeliness items, which is another argument for separating the three parts of the PPS in cross-cultural comparisons.

Our findings indicate that there might exist a small sex difference, with men procrastinating more than women. Steel (2007) found similar results in his meta-analysis of 8756 participants. However, this difference was marginal, implying that this difference may not have any real-life implications. Also, the current study did not obtain the same results for the two samples that were recruited in Finland and Poland, suggesting that there might be other explanations for this difference than sex *per se*, e.g., cultural aspects or diverging social expectations for men and women. In addition, the effect of age on procrastination was observed in the current study, giving further support to the idea of decreased levels of procrastination with increased age (Steel and Ferrari, 2013). This is also in line with numbers showing that one-fifth of the adult population regard themselves as having difficulties of procrastination (Harriott and Ferrari, 1996), while at least half of the student population have recurrent problems completing their commitments. Why this is the case might be explained by a number of factors, and it has been argued that greater life experience results in less procrastination, as should the development of executive functions and changes in the perception of time, both of which are affected by age (Rozental and Carlbring, 2014).

With regard to the employee vs. student subgroups, the findings in the current study are similar to that of Steel and Ferrari (2013), indicating that being a student is associated with more procrastination. As noted, this may be related to age (Steel and Ferrari, 2013), but it could be important to consider contextual effects as well, that is, a work environment relies more on external control and predefined goals than an academic setting (Nguyen et al., 2013). Also, although the results were a bit inconclusive, a higher educational level was somewhat related to less procrastination, in accordance with Steel and Ferrari (2013), potentially reflecting a difference between the participants in terms of traits or features important for completing a higher academic degree, e.g., self-control (Steel, 2007). Similarly, being single as compared to in a relationship was also linked to more procrastination, as has been found in prior research (Steel and Ferrari, 2013). Again, the context might influence the degree of dilatory behavior, assuming that a partner makes sure that commitments are completed according to schedule and provides social support, which would limit the opportunity for delaying tasks and assignments. Furthermore, correlations between procrastination and different aspects related to well-being and mood have been found in several studies (Sirois et al., 2003; Sirois, 2007; Beutel et al., 2016), supporting the results in the current study where procrastination was linked to less satisfaction with life, as assessed by the SWLS (Diener et al., 1985). Given a definition of procrastination that emphasizes the negative consequences that delay may render, this association is not surprising. Although the relationship between procrastination and performance has been criticized for being inconsistent (Kim and Seo, 2015), it is never regarded as a particularly helpful behavior, often causing unnecessary stress, worry, and negative emotions (Steel, 2007).

As for the findings in the current study, several limitations and issues warranting further research need to be considered when reviewing the results. First, an obvious drawback pertains to the languages, and thus cultures, that were included. Although participants were recruited from different countries and settings, giving some credence to the generalizability of the results, cultural differences, particularly the timeliness aspect of procrastination, needs to be explored in more detail, using translations of the PPS and IPS in other languages. Second, as with all surveys and investigations implementing self-report measures, the risk of selection effects and biases has to be taken into account. Participants in the current study were invited in lectures, by email invitations at institutes and institutions, and through social media, making it possible to recruit individuals from a variety of different contexts. However, it is reasonable to suspect that those already experiencing difficulties of procrastination, or having a particular interest of this issue, participated to a greater extent, which may have influenced the results. In order to prevent some of these selection effects, the information given about the study did not contain any details regarding its aims, only instructing the participants to reflect upon their study or work habits. In terms of biases, social desirability might have occurred, making the participants respond in a way that is not perceived negatively by others, i.e., less problem with procrastination. Given the anonymity in the current study and that it did not include any type of feedback on the results, this risk should, however, be limited. Third, when measuring procrastination, more and more authors explicitly acknowledge the difference between procrastination and other forms of delay (e.g., Corkin et al., 2011; Grunschel et al., 2013; Klingsieck, 2013a; Krause and Freund, 2014). They agree that procrastination is an acratic, i.e., irrational, behavior pattern (cf. Andreou, 2007), while other forms of delay have a strategic nature. This acratic nature of procrastination is reflected by the conceptualization of the PPS and IPS. However, both scales fail to capture whether the delay has negative consequences for the participants. Furthermore, Steel et al. (2001) argue that self-report measures of procrastination may be influenced by a number of factors, most notably, unwillingness to provide an accurate account of one's difficulties, as well as the impact of emotional states, such as, depression, anxiety, and

[6]www.geert-hofstede.com

low self-esteem, which could affect the subjective perception of not being able to complete tasks and assignments. In addition, Rozental and Carlbring (2014) discuss some of the drawbacks of relying solely on self-report measures of procrastination, including the issue of differentiating more severe and chronic procrastinators from trivial cases of putting something off, which is of particular importance in assessing the prevalence of procrastination in the general population. Embracing additional ways of determining the level of procrastination could therefore be of value, both in terms of more comprehensive self-report measures as well as other types of assessments with greater ecological validity.

AUTHOR CONTRIBUTIONS

All authors participated in data collection. FS and GP did the data analysis. KK, AR, and FS wrote the manuscript. All authors have read and suggested improvements in several iterations of the manuscript preparation.

REFERENCES

Ackerman, D. S., and Gross, B. L. (2005). My instructor made me do it: task characteristics of procrastination. *J. Mark. Educ.* 27, 5–13. doi: 10.1177/0273475304273842

Aitken, M. E. (1982). *A Personality Profile of the College Student Procrastinator*. Ph.D. dissertation, University of Pittsburgh, Pittsburgh.

Andreou, C. (2007). Understanding procrastination. *J. Theory Soc. Behav.* 37, 183–193. doi: 10.1111/J.1468-5914.2007.00331.X

Beutel, M. E., Klein, E. M., Aufenanger, S., Brahler, E., Dreier, M., Muller, K. W., et al. (2016). Procrastination, distress and life satisfaction across the age range - a german representative community study. *PLoS ONE* 11:e0148054. doi: 10.1371/journal.pone.0148054

Brown, T. A. (2015). *Confirmatory Factor Analysis for Applied Research*. New York, NY: The Guilford Press.

Byrne, B. M. (2001). Structural equation modeling with AMOS, EQS, and LISREL: comparative approaches to testing for the factorial validity of a measuring instrument. *Int. J. Test.* 1, 55–86. doi: 10.1207/S15327574IJT0101_4

Byrne, B. M. (2008). Testing for multigroup equivalence of a measuring instrument: a walk through the process. *Psicothema* 20, 872–882.

Cheung, G. W., and Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measure-ment invariance. *Struct. Equ. Modeling* 9, 233–255. doi: 10.1207/S15328007SEM0902_5

Corkin, D. M., Shirley, L. Y., and Lindt, S. F. (2011). Comparing active delay and procrastination from a self-regulated learning perspective. *Learn. Individ. Differ.* 21, 602–606. doi: 10.1016/j.lindif.2011.07.005

Day, V., Mensink, D., and O'Sullivan, M. (2000). Patterns of academic procrastination. *J. Coll. Read. Learn.* 30, 120–134. doi: 10.1080/10790195.2000.10850090

Deniz, M. E. (2006). The relationships among coping with stress, life satisfaction, decision-making styles and decision self-esteem: an investigation with Turkish university students. *Soc. Behav. Pers.* 34, 1161–1170. doi: 10.2224/sbp.2006.34.9.1161

Diener, E., Emmons, R. A., Larsen, R. J., and Griffin, S. (1985). The satisfaction with life scale. *J. Pers. Assess.* 49, 71–75. doi: 10.1207/s15327752jpa4901_13

Ferrari, J. R. (1992). Psychometric evaluation of two procrastination inventories for adults: arousal and avoidance measures. *J. Psychopathol. Behav. Assess.* 14, 97–110. doi: 10.1007/BF00965170

Grunschel, C., Patrzek, J., and Fries, S. (2013). Exploring different types of academic delayers: a latent profile analysis. *Learn. Individ. Differ.* 23, 225–233. doi: 10.1016/j.lindif.2012.09.014

Harriott, J., and Ferrari, J. R. (1996). Prevalence of procrastination among samples of adults. *Psychol. Rep.* 78, 611–616. doi: 10.2466/pr0.1996.78.2.611

Hicks, R., and Storey, J. (2015). Can procrastination be effective? A study of white-collar employees and university students. *Int. J. Bus. Res.* 15:39. doi: 10.18374/IJBR-15-1.4

Hirschfeld, G., and von Brachel, R. (2014). Multiple-Group confirmatory factor analysis in R–A tutorial in measurement invariance with continuous and ordinal indicators. *Prac. Assess. Res. Eval.* 19:2.

Howell, A. J., and Watson, D. C. (2007). Procrastination: associations with achievement goal orientation and learning strategies. *Pers. Individ. Dif.* 43, 167–178. doi: 10.1016/j.paid.2006.11.017

Kankaraš, M., and Moors, G. (2010). Researching measurement equivalence in cross-cultural studies. *Psihologija* 43, 121–136. doi: 10.2298/PSI1002121K

Kim, K. R., and Seo, E. H. (2015). The relationship between procrastination and academic performance: a meta-analysis. *Pers. Individ. Dif.* 82, 26–33. doi: 10.1016/j.paid.2015.02.038

Klassen, R. M., Ang, R. P., Chong, W. H., Krawchuk, L. L., Huan, V. S., Wong, I. Y., et al. (2010). Academic procrastination in two settings: motivation correlates, behavioral patterns, and negative impact of procrastination in Canada and Singapore. *Appl. Psychol.* 59, 361–379. doi: 10.1111/j.1464-0597.2009.00394.x

Kline, R. B. (2016). *Principles and Practice of Structural Equation Modeling*, 4th Edn. New York, NY: The Guilford Press.

Klingsieck, K. B. (2013a). Procrastination - When good things don't come to those who wait. *Eur. Psychol.* 18, 24–34. doi: 10.1027/1016-9040/a000138

Klingsieck, K. B. (2013b). Procrastination in different life-domains: is procrastination domain specific? *Curr. Psychol.* 32, 175–185. doi: 10.1007/s12144-013-9171-8

Krause, K., and Freund, A. M. (2014). Delay or procrastination – A comparison of self-report and behavioral measures of procrastination and their impact on affective well-being. *Pers. Individ. Dif.* 63, 75–80. doi: 10.1016/j.paid.2014.01.050

Lay, C. H. (1986). At last, my research article on procrastination. *J. Res. Pers.* 20, 474–495. doi: 10.1016/0092-6566(86)90127-3

Mann, L. (2016). Procrastination revisited: a commentary. *Aust. Psychol.* 51, 47–51. doi: 10.1111/ap.12208

Mann, L., Burnett, P., Radford, M., and Ford, S. (1997). The Melbourne decision making questionnaire: an instrument for measuring patterns for coping with decisional conflict. *J. Behav. Decis. Mak.* 10, 1–19. doi: 10.1002/(sici)1099-0771(199703)10:1<1::aid-bdm242>3.0.co;2-x

Mann, L., Radford, M., Burnett, P., Ford, S., Bond, M., Leung, K., et al. (1998). Cross cultural differences in self-reported decision making style and confidence. *Int. J. Psychol.* 33, 325–335. doi: 10.1002/(SICI)1099-0771(199703)10:1<1

McCown, W., Johnson, J., and Petzel, T. (1989). Procrastination, a principal components analysis. *Pers. Individ. Dif.* 10, 197–202. doi: 10.1016/0191-8869(89)90204-3

Nguyen, B., Steel, P., and Ferrari, J. R. (2013). Procrastination's impact in the workplace and the workplace's impact on procrastination. *Int. J. Sel. Assess.* 21, 388–399. doi: 10.1111/ijsa.12048

Pavot, W., and Diener, E. (2008). The satisfaction with life scale and the emerging construct of life satisfaction. *J. Posit. Psychol.* 3, 137–152. doi: 10.1080/17439760701756946

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88, 879. doi: 10.1037/0021-9010.88.5.879

Rebetez, M. M. L., Rochat, L., Gay, P., and Van der Linden, M. (2014). Validation of a French version of the pure procrastination scale (PPS). *Compr. Psychiatry* 55, 1442–1447. doi: 10.1016/j.comppsych.2014.04.024

Reinecke, K., Nguyen, M. K., Bernstein, A., Näf, M., and Gajos, K. Z. (2013). "Doodle around the world: online scheduling behavior reflects cultural differences in time perception and group decision-making. *Paper Presented at the 2013 2nd ACM Conference on Computer Supported Cooperative Work, CSCW 2013*, San Antonio, TX.

Rosseel, Y. (2012). lavaan: an R package for structural equation modeling. *J. Stat. Softw.* 48, 1–36. doi: 10.3389/fpsyg.2014.01521

Rozental, A., and Carlbring, P. (2014). Understanding and treating procrastination: a review of a common self-regulatory failure. *Psychology* 05, 1488–1502. doi: 10.4236/psych.2014.513160

Rozental, A., Forsell, E., Svensson, A., Forsström, D., Andersson, G., and Carlbring, P. (2014). Psychometric evaluation of the Swedish version of the pure procrastination scale, the irrational procrastination scale, and the susceptibility to temptation scale in a clinical population. *BMC Psychol.* 2:54. doi: 10.1186/s40359-014-0054-z

Satorra, A., and Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika* 66, 507–514. doi: 10.1007/BF02296192

Schmitt, N., and Stults, D. M. (1985). Factors defined by negatively keyed items: the result of careless respondents? *Appl. Psychol. Meas.* 9, 367–373. doi: 10.1177/014662168500900405

Schouwenburg, H. C. (1995). "Academic procrastination: theoretical notions, measurement, and research," in *Procrastination and Task Avoidance: Theory, Research, and Treatment*, eds J. R. Ferrari, J. L. Johnson, and W. G. McCown (New York, NY: Plenum Press), 71–96.

Schraw, G., Wadkins, T., and Olafson, L. (2007). Doing the things we do: a grounded theory of academic procrastination. *J. Educ. Psychol.* 99:12. doi: 10.1037/0022-0663.99.1.12

Senécal, C., Julien, E., and Guay, F. (2003). Role conflict and academic procrastination: a self-determination perspective. *Eur. J. Soc. Psychol.* 33, 135–145. doi: 10.1002/ejsp.144

Sirois, F. (2007). "I'll look after my health, later": a replication and extension of the procrastination–health model with community-dwelling adults. *Pers. Individ. Dif.* 43, 15–26. doi: 10.1016/j.paid.2006.11.003

Sirois, F., Melia-Gordon, M. L., and Pychyl, T. A. (2003). "I'll look after my health, later": an investigation of procrastination and health. *Pers. Individ. Dif.* 35, 1167–1184. doi: 10.1016/s0191-8869(02)00326-4

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

Steel, P. (2010). Arousal, avoidant and decisional procrastinators: do they exist? *Pers. Individ. Dif.* 48, 926–934. doi: 10.1016/j.paid.2010.02.025

Steel, P., Brothen, T., and Wambach, C. (2001). Procrastination and personality, performance, and mood. *Pers. Individ. Dif.* 30, 95–106. doi: 10.1016/s0191-8869(00)00013-1

Steel, P., and Ferrari, J. (2013). Sex, education and procrastination: an epidemiological study of procrastinators' characteristics from a global sample. *Eur. J. Pers.* 27, 51–58. doi: 10.1002/per.1851

Svartdal, F. (2015). Measuring procrastination: psychometric properties of the Norwegian versions of the irrational procrastination scale (IPS) and the pure procrastination scale (PPS). *Scand. J. Educ. Res.* 1–13. doi: 10.1080/00313831.2015.1066439

Tice, D. M., and Baumeister, R. F. (1997). Longitudinal study of procrastination, performance, stress, and health: the costs and benefits of dawdling. *Psychol. Sci.* 8, 454–458. doi: 10.1111/j.1467-9280.1997.tb00460.x

van Herk, H., Poortinga, Y. H., and Verhallen, T. M. (2004). Response styles in rating scales evidence of method bias in data from six EU countries. *J. Cross Cult. Psychol.* 35, 346–360. doi: 10.1177/0022022104264126

Wang, M., Rieger, M. C., and Hens, T. (2016). How time preferences differ: evidence from 53 countries. *J. Econ. Psychol.* 52, 115–135. doi: 10.1016/j.joep.2015.12.001

Wu, A. D., Li, Z., and Zumbo, B. D. (2007). Decoding the meaning of factorial invariance and updating the practice of multi-group confirmatory factor analysis: a demonstration with TIMSS data. *Prac. Assess. Res. Eval.* 12, 1–26.

Zercher, F., Schmidt, P., Cieciuch, J., and Davidov, E. (2015). The comparability of the universalism value over time and across countries in the European Social Survey: exact vs. approximate measurement invariance. *Front. Psychol.* 6:733. doi: 10.3389/fpsyg.2015.00733

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Intervention to reduce procrastination in first-year students: Preliminary results from a Norwegian study

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Our study indicates that a brief intervention program for students may help reduce academic procrastination, write Kent Nordby and colleagues.

BY: Kent Nordby, Catharina Elisabeth Arfwedson Wang, Tove Irene Dahl and Frode Svartdal

Procrastination is one of the most challenging problems facing students today. Procrastination refers to the voluntary delay of intended tasks despite expecting to be worse off because of the delay (Steel, 2007). Students are especially prone to dilatory behavior, with prevalence estimates ranging from 30% to 60% (Rabin, Fogel, & Nutter-Upham, 2011) or even higher (Steel, 2007). In contrast, the prevalence in the normal population is 20% (Steel, 2007). In students, procrastination manifests itself as a delay in academic tasks such as writing term papers, studying for exams, and doing other necessary coursework. More than half of all students express a need for help in handling their procrastination (Gallagher, Golin, & Kelleher, 1992). Procrastination affects academic performance negatively (Steel, 2007) and is also related to increased stress (Sirois, 2014), depression and anxiety (Flett, Blankstein, & Martin, 1995; Stöber & Joormann, 2001), worry (Antony, Purdon, Huta, & Swinson, 1998; Ferrari, Johnson, & McCown, 1995), and shame and guilt (Fee & Tangney, 2000; Pychyl, Lee, Thibodeau, & Blunt, 2000). Procrastinators report lower levels of self-compassion, suggesting that self-kindness and self-acceptance may be difficult for those who needlessly delay (Sirois, 2014). In sum, procrastination may be a serious problem for students, and its seriousness escalates as the procrastination increases.

Personality traits such as high impulsivity, low self-control, and low conscientiousness predict procrastination (Gustavson, Miyake, Hewitt, & Friedman, 2014; Steel 2007). Procrastination has been described as a prototypical example of failure in self-regulation (Steel, 2007) and is also often regarded as a strategy to escape negative emotions such as stress and anxiety—i.e., “giving in to feel good” (Tice & Bratslavsky, 2000). The tendency to procrastinate is especially likely when dealing with tasks that have long or unclear deadlines (Ariely & Wertenbroch, 2002; Schraw, Wadkins, & Olafson, 2007) and when tasks are boring or aversive (Steel, 2007). Pychyl and colleagues (2000) found that boring or aversive tasks increased the likelihood of engaging in distracting behaviors such as watching television, playing on the computer, and chatting with friends, indicating that procrastination involves both the delay of intended tasks and a preference for alternative short-term pleasurable activities. It is

not surprising, therefore, that high procrastination is associated with a low degree of self-determined motivation (Lee, 2005; Steel, 2007).

A large number of self-help books, Internet resources, and theoretical papers describe possible methods to reduce procrastination, yet the number of studies demonstrating effective interventions is relatively low. One recommended intervention strategy is teaching better time management, i.e., skills and behaviors relating to task and time awareness, planning, goal setting, prioritizing, scheduling, organizing, and establishing new and improved time habits (Hellsten & Rogers, 2009; Karas & Spada, 2009; Schmitz & Wiese, 2006). For example, Häfner, Oberst, and Stock (2014) administered a four-hour time management program that taught undergraduates how to better organize their time. It included modules focusing on implementation intentions, prioritizing, monitoring, and structuring of their workday. After one month, participants demonstrated a significantly better distribution of workload across the term compared to control students.

Other studies have indicated positive effects of setting deadlines (Ariely & Wertenbroch, 2002; Lamwers & Jazwinski, 1989; Roberts, Fulton, & Semb, 1988), imposing working time restrictions (Höcker, Engberding, Haferkamp, & Rist, 2012), implementing enforced daily writing sessions (Boice, 1989), and controlling stimuli such as removing distractions from the work area (Ziesat, Rosenthal, & White, 1978). Promising results have also been found from a short mindfulness group-training intervention (Scent & Boes, 2014).

Because procrastination has been connected to dysfunctional beliefs such as unrealistic expectations, low self-efficacy, and negative thoughts (Pychyl & Flett, 2012), the use of cognitive behavioral therapy (CBT) has been suggested as a remedy. In CBT, procrastinators are taught to dispute their irrational thoughts and beliefs, develop goals, and develop a mindset that enables them to persist better in doing aversive tasks (Neenan, 2008). Rozental et al. (2015) developed an online 10-week treatment program for participants with clinical levels of procrastination. Two groups receiving guided or non-guided self-help interventions demonstrated a significant reduction in procrastination at post-treatment and follow-up compared to a control group. Other intervention studies have found that more traditional in-vivo group CBT also reduces procrastination (Ozer, Demir, & Ferrari, 2013).

Overall, intervention studies such as those discussed indicate that procrastination can be ameliorated. In addition to reducing procrastination, other beneficial effects of interventions include a more positive attitude toward studying (e.g., Ziesat, Rosenthal, & White, 1978), better grades (Tuckman, 1998; Wesp, 1986), and reduced stress (Wäschle et al., 2014).

The present study

The purpose of the present study was to assess the usefulness of a brief intervention against procrastination for Norwegian students. The need for such an intervention,

particularly among beginner students, is obvious. At least one-third of college and university students demonstrate procrastination levels that significantly handicap them in their work, both in the short-term and the long-term perspectives (Botnmark, Kvalnes, & Svartdal, 2014). Ideally, interventions should address such groups specifically (Rozental et al., 2015), but a more practical approach is to present intervention or prevention efforts for larger groups of students as part of their normal curriculum (e.g., Tuckman & Kennedy, 2011). Although such an approach limits the possibility of randomizing participants to conditions, it still can provide valuable information about factors associated with positive change. Such general interventions would also be feasible, especially for introductory psychology students. That is because the topics addressed are easily included in their regular curriculum. Hence, the present intervention was implemented as a part of psychology students' regular course of study. It consisted of lectures and seminar sessions given over a four-week period as well as reading material related to procrastination and techniques to overcome the issue.

The course included a combination of elements previously found to be effective in reducing academic procrastination: (1) Information about the procrastination habit, and its causes and consequences. Special emphasis was put on the importance of self-awareness (i.e., identifying behaviors, irrational thoughts, and emotions related to procrastination), because increased attention has been found to strengthen self-regulation (Baumeister & Heatherton, 1996); (2) Information related to time management skills and planning, with a focus on task and time awareness, planning, goal setting, and establishing improved time use habits; and (3) Cognitive behavioral therapy techniques (Rozental et al., 2015), including the management of thoughts and feelings (e.g., negative or irrational thoughts, failure, guilt, shame, and stress) related to dilatory behavior.

To assess changes related to the intervention, scales measuring procrastination and time management skills were administered in a simple pre/post design. Overall, we expected the intervention to be associated with a reduction in procrastination scores. We also anticipated that students with higher levels of procrastination would benefit more from the course because students with high procrastination levels are often motivated to change (Onwuegbuzie, 2004). We included two procrastination scales, one rather abstract and trait-oriented, the other more concrete and behavior-oriented. Both scales should demonstrate changes associated with the intervention, but the behavior-oriented scale was expected to be more sensitive in capturing short-term changes in procrastination. Because time management skills are closely related to procrastination, we expected changes in such skills to mirror eventual changes in procrastination scores. A questionnaire measuring positive motivation to study was also administered. Because procrastination is negatively related to positive motivation (Lee, 2005), students with low motivation were expected to demonstrate higher procrastination scores at pre-test. However, because the role of motivation in bringing about positive change in procrastination is uncertain, this issue was further explored in

the analyses.

Method

Participants

From a pool of approximately 300 students who were enlisted in an introductory psychology course and enrolled in the autumn term at a university in Norway, 219 students (164 females) participated. A majority were first-year students, mean age = 21.7 years (SD = 4.33). All participated in exchange for joining a lottery with a chance to win a digital tablet or mobile phone.

Instruments

Irrational Procrastination Scale (IPS). The IPS (Steel, 2010) is a self-reported scale measuring habitual delay in behavioral implementation. The scale contains items from three established procrastination scales and is assumed to measure a unidimensional construct, "irrational delay," with "irrational" referring to the delay as disadvantageous to the person and further that the person also realizes this fact (Steel, 2010). IPS consists of nine items (e.g., "I put things off so long that my well-being or efficiency unnecessarily suffers"), three of which are inconsistent with procrastination and thus are reversed before analysis. All items are rated on a five-point Likert-scale (1–5), with higher scores indicating more problems with procrastination. The Norwegian version was translated and validated by Svartdal (2015), with good internal consistency (Cronbach's α = .85–.91). In the present study, Cronbach's α at pre-test was .92.

Self-Regulation Scale (SRS). The Self-Regulation Scale (Job, Walton, Bernecker, & Dweck, 2015) is a self-reported scale that was developed to measure everyday self-regulation failure during the previous week (27 questions). Six of these items were selected for the present study, all of which relate to specific examples of procrastination during the previous week (e.g., Items 1 and 2: "During the last week: How often did you delay doing something for your studies, even when it was important?"; "How often did you postpone starting studying, even if it would have been important to start?"). The questions are answered on an ordinal seven-point scale, with 1 being "Never" and 7 being "Twice or more per day." Cronbach's α for the procrastination part of the SRS is α = .78–.87, and the items seem to measure a unidimensional construct (Haug, 2016; Job et al., 2015). In the present study, Cronbach's α was .81 at pre-test. Previous studies have indicated that this procrastination scale correlates highly with IPS (Haug, 2016), r = .53–.68. Of importance here is that IPS measures procrastination as a relatively stable trait, whereas the SRS addresses specific examples of procrastination behavior occurring in the past week. For this reason, the latter scale should be superior in measuring changes in procrastination behavior.

Time Management Questionnaire (TMQ). This questionnaire was developed by Britton and Tesser (1991) to evaluate students' use of time-management techniques. It is

composed of 35 items covering three aspects of time management (short-range planning, time attitudes, and long-range planning) and is answered on a five-point Likert-scale (1–5). For this study, we selected the seven items from the short-range planning subscale (e.g., “Do you make a list of the things you have to do each day?”). Britton and Tesser (1991) identified these items to constitute one of three factors in the TMQ. Cronbach’s α for these items at pre-test was .87.

Motivational questionnaire. We created four questions related to positive emotions toward course and schoolwork (e.g., “I enjoy working on the subject” and “I always do my best when working on a subject”). The purpose of these questions was to address the degree of positive motivation toward studying, the coursework, and the subject in general. Cronbach’s α for these items at pre-test was .80.

Intervention

The first lecture introduced the procrastination problem and how it manifests itself. Emphasis was put on the fact that procrastination is a negative habit that can be changed. In the next two lectures, students were guided in techniques of task and time management, the importance of using calendars, and suggestions on how to structure and monitor their daily activities. Additionally, students were encouraged to start using to-do lists and to set appropriate deadlines for themselves. They were also taught how to better evaluate the duration of academic tasks. Topics related to change (e.g., fixed vs. growth mindset) were discussed as well. In the final lecture, students were introduced to cognitive behavioral therapy (CBT), explaining how thoughts, feelings, and behavior interplay in procrastination. After the last week of lectures, students had the option to participate in a two-hour seminar. Here students could practice using techniques from the lectures as well as prepare for exam questions related to the contents of the intervention.

Procedure

The intervention had a duration of four consecutive weeks in the middle of the autumn term, with a total of four lectures and two seminars. Students answered a web-based questionnaire (www.qualtrics.com) before the first lecture (pre) and then again one week after the final lecture (post). Participation was voluntary and responses were given anonymously. Before getting access to the questionnaires, the students received information regarding the study’s purpose. By starting the questionnaires, they gave active consent to be included in the study. The project of which the current study is part received ethical approval from the Regional Ethical Board in Tromsø, Norway (REK nord 2014/2313).

Results and discussion

Procrastination. Of primary interest in this context was whether procrastination scores changed from pre-test to post-test. The IPS data were analyzed with repeated

measures ANOVA, with time (pre vs. post) as the repeated measures factor. The ANOVA indicated a significant overall effect of time, $F(1, 108) = 5.48$, $p = .021$. A more specific test of change would be to compare pre/post levels in low (IPS score < 2.5), medium (IPS scores of 2.5–3.5), and high (IPS scores > 3.5) procrastinators. The expectation here was that students high in procrastination (IPS score > 3.5) would demonstrate positive change. This predicted change would manifest itself as a procrastination level * pre/post interaction effect. This expectation was supported by the ANOVA since the interaction between procrastination level and pre/post change was significant, $F(2, 106) = 5.31$, $p = .006$. Participants with IPS scores > 3.5 (n = 30) demonstrated a reduction in procrastination from 3.97 to 3.62. Contrast analysis confirmed that this change was significant, $F(1, 106) = 15.31$, $p = .00016$, $n^2 = .25$, a medium to large effect size. This change is shown in Figure 1, leftmost panel. A corresponding analysis of the SRS procrastination scores indicated similar reductions, with an significant overall pre vs. post effect, $F(1, 112) = 7.52$, $p = .007$. The planned contrast for the high procrastination group was also significant, $F(1, 108) = 11.76$, $p = .0009$, $n^2 = .18$. Overall, these results demonstrate that both procrastination measures indicated significantly positive pre/post changes, with a pronounced reduction in both procrastination measures for participants with high initial procrastination scores. Both procrastination measures seemed to be equally sensitive to pre vs. post changes. Because the pre/post change in procrastination scores could be explained in terms of selection effects, we compared the procrastination levels between students completing the post phase of the study vs. students who did not complete that phase, and no difference at pre-test appeared, $F(1, 189) = .100$, $p = .75$.

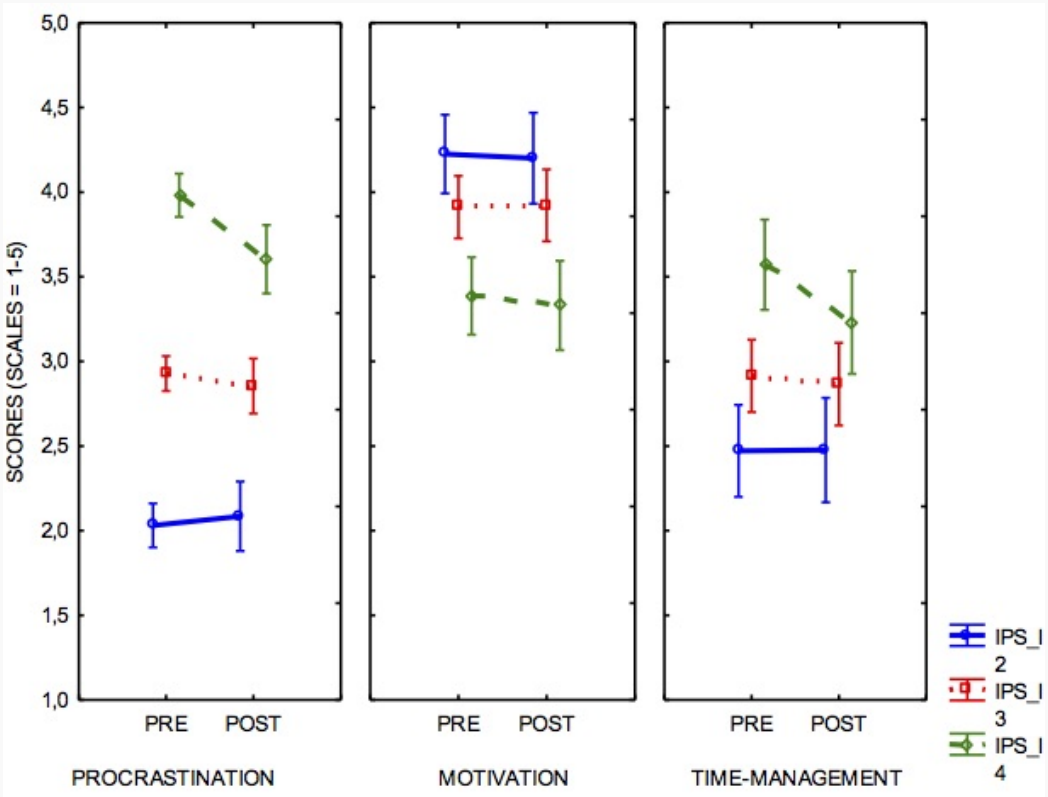

FIGURE 1: Pre vs. post levels on the IPS (left panel), motivation questionnaire (middle panel), and TMQ (rightmost panel) for students at different procrastination levels at pre-test.

Time management skills. A corresponding analysis of changes in TMQ scores indicated a non-significant overall pre/post effect, $F(1, 108) = 3.24$, $p = .075$, but a significant change in students with initial high procrastination levels occurred, $F(1, 106) = 8.04$, $p = .005$. These results are displayed in Figure 1, rightmost panel.

Motivation. Because none of the intervention components addressed motivation-enhancing topics specifically, no change in motivation scores between pre and post probes was expected, and none occurred, $F(1, 108) = 0.11$, $p = .74$. Even the group highest in procrastination, while demonstrating positive changes in procrastination and time management skills from pre-test to post-test, did not demonstrate any change in motivational scores. Students with low motivation were expected to procrastinate more than students with high motivation. This expectation was confirmed as the correlation between motivation and IPS scores, both at pre-test, was high, $r = –.50$. Hence, students low in procrastination (IPS score < 2.5) demonstrated the highest mean motivation score (mean = 4.21), whereas those with medium and high procrastination scores had means of 3.91 and 3.36 respectively.

Relation between pre/post differences in time management and procrastination. To assess possible factors associated with the observed reduction in procrastination, reduction as measured by the IPS pre/post measures were entered into a stepwise multiple regression analysis, with change scores in motivation and TMQ as predictors. Sex and age were also entered in the analysis. TMQ and motivation change scores

were first entered, indicating an R^2 = .14, with TMQ as the best predictor, t = 3.59, p = .0005. Adding sex and age into the model did not change this conclusion. Finally, analyzing the correlations between change scores of TMQ, IPS, and SRS for the three groups of procrastinators (low, medium, and high), a difference in outcome was indicated: Whereas high procrastinators demonstrated a strong correlation between TMQ and IPS changes (r = .52), low procrastinators did not (r = .09). The reverse trend was observed for SRS: Low and medium procrastinators demonstrated a stronger correlation between TMQ and SRS (r = .41 and .35), whereas high procrastinators demonstrated a lower correlation (r = .24). This tendency may indicate that high procrastinators reduce their procrastination levels more abstractly (as measured by IPS), whereas low procrastinators do it concretely (as measured by SRS).

General discussion

This study investigated changes in procrastination scores related to a lecture- and seminar-based intervention for reducing procrastination among first-year university students. The intervention consisted of four lectures as well as a seminar on procrastination and strategies to overcome it, all given over four weeks, as well as relevant reading material. Two measures of procrastination were used, the Irrational Procrastination Scale (IPS) and a subscale of the Self-Regulation Scale (SRS). In addition, time management skills (TMQ) and motivation to study were measured.

Overall, a significant reduction in procrastination as measured by the two scales occurred from pre- to post-test. As predicted, students high in procrastination before the intervention demonstrated the most positive change, with a significant reduction in procrastination scores, compared to little or no changes at lower procrastination levels. The scale focusing on specific procrastination behaviors (SRS) indicated a similar overall change compared to the more abstract and general scale (IPS). These results indicate that a brief intervention, such as the one reported in the present paper, can have a positive effect for students needing it most, whereas other students may demonstrate little or no benefit.

Results from the TMQ showed that students high in procrastination displayed an improved score in time management skills at the end of the intervention, while moderate and low procrastinating students demonstrated no change. In effect, reduction in procrastination was closely associated with changes in TMQ. Interestingly, high procrastinators seemed to demonstrate improved time management scores correlated with lower procrastination scores on the abstract and trait-oriented IPS scale, whereas low procrastinators demonstrated improved time management scores correlated with lower scores on the concrete (behavioral) SRS scale. This tendency indicates a potential benefit in using the SRS measure. Even if this scale may not be more sensitive in capturing short-term changes in procrastination compared to the IPS,

it may be more sensitive in capturing real-life behavioral changes.

As expected, students with low motivation to study were found to procrastinate more than students with high motivation. However, even if high procrastinators reduced their procrastination scores and also increased their TMQ scores, no change in motivation was observed. This is understandable because no intervention efforts were specifically directed at enhancing motivation. It is also worrisome, however, because a potential side effect of the intervention might have been an increased motivation to study. Longitudinal studies may be required to capture any changes in motivation related to a reduction in procrastination.

Although positive, these results must be interpreted with caution. First, a simple pre/post design with no control group cannot document that the observed changes can be attributed to the intervention. Hence, further studies with better control should be carried out. Controlled studies should also measure the short-term as well as the long-term effects of interventions. Such studies should consider a more focused approach where students in need of help with their procrastination problem (e.g., with IPS scores > 3.0) are invited specifically. Students with moderate or low procrastination scores may feel little need to change, and smaller groups with specific needs would enable researchers to adapt course contents to such needs. Procrastinators differ (e.g., Rozental et al., 2015; Steel & Klingsieck, 2016), and interventions adapted to specific needs may be expected to work better than general interventions. For example, some students may procrastinate because of fear of failure and worries related to high-performance standards (perfectionism), whereas procrastination in others may be related to general withdrawal and avoidance. Some students have minor—but still disadvantageous—problems with procrastination whereas others may suffer quite severely from their dysfunctional habit. Adapting interventions to specific needs may be advantageous in terms of efficacy and more appealing to the students.

A second issue complicating the interpretation of the present data is that post-data were collected toward the end of the term, when students are more compelled to work and hence to procrastinate less, aptly called the “deadline rush” (Dewitte & Schouwenburg, 2002; König & Kleinmann, 2005; Watson, Powell, & Buro, 2006). However, how the “deadline rush” relates to changes in procrastination scores is not obvious. With time getting more valuable toward the end of the semester, students might feel that even small incidences of procrastination feel even worse than long delays earlier in the term when time was plentiful. If that is the case, students might report more procrastination as exams draw closer. The present data did not indicate such an increase; on the contrary, procrastination levels were stable for low and medium procrastinators and decreased in high procrastinators. Wäschle et al. (2014) observed an opposite trend to the “deadline rush” in that the students in control conditions reported less procrastination as exams approached. This may reflect a tendency to catch up, which is probably stronger for high procrastinators because they have more work to catch up on. Whether this propensity explains the change observed

in high procrastinators in the present study remains to be settled in future studies with comparison groups of high procrastinators who do not receive an intervention.

The use of self-reported measures in evaluations of effectiveness can be problematic (Höcker et al., 2012), and high reliability of the procrastination measure is a prerequisite for detecting changes. The test/retest reliability of IPS over four months is relatively high, r = .67 (Steel, 2010). In the present study, test/retest reliability should be higher given only four weeks between tests. A strength of the present study is that two variants of self-reported procrastination were used. The IPS captures the general feeling of subjective delay (e.g., “I delay tasks beyond what is reasonable”), whereas SRS asks more concretely how much the respondent has delayed in the last week (e.g., “How often did you watch TV instead of studying?”). A high correlation between these two measures is reassuring, and a further benefit from using them is that they may indicate different forms of change. In the present study, the overall close correlation between TMQ changes and changes in procrastination translated into somewhat different changes in high vs. low procrastinators: High procrastinators seemed to demonstrate a cognitive or subjective change as expressed in IPS scores, whereas low procrastinators demonstrated a corresponding behavioral change as expressed in SRS scores. This may indicate that the real-life effects of interventions are better measured by instruments such as SRS and further that the outcome of intervention studies should include behavioral measures to supplement self-reported measures (Tuckman & Kennedy, 2011).

Implications and recommendations for future research

Although the results of this study are promising, future research should further examine the causal role of intervention efforts against procrastination in academic settings. For such examination, designs with a randomized allocation of participants to conditions is preferable. Given that motivation to study is a good predictor of procrastination but—as seen in this study—is itself quite stable over time, a measure focusing on motivation to change would probably be useful, both in the recruitment process and in the prediction of potential beneficial outcome (Onwuegbuzie, 2004). Increased focus on recruitment would also allow for interventions adapted to specific needs, with potential benefits in both outcome measures and motivation to attend. Finally, although interventions against procrastination may be helpful, a preferred strategy would be to prevent dysfunctional procrastination habits to develop in the first place. This problem can be approached in two rather different ways. One is to train students not to procrastinate in preventive interventions. The other is to focus on the structural and cultural properties of student academic life, which undoubtedly represent a continuous invitation to many forms of unnecessary and irrational delay, thereby causing almost all students to procrastinate. Steel and Ferrari (2013) note that countries like Britain and the USA are exploring public policy changes to prevent procrastination, and Peru has launched government programs to reduce mañana (lateness). Future research should explore similar strategies for student academic life.

References

Antony, M. M., Purdon, C. L., Huta, V., & Swinson, R. P. (1998). Dimensions of perfectionism across the anxiety disorders. *Behaviour Research and Therapy*, *36*(12), 1143–1154. doi:10.1016/S0005-7967(98)00083-7

Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological Science*, *13*(3), 219–224. doi:10.1111/1467-9280.00441

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7*(1), 1–15. doi:10.1207/s15327965pli0701_1

Boice, R. (1989). Procrastination, busyness, and bingeing. *Behaviour Research and Therapy*, *27*(6), 605–611. doi:10.1016/0005-7967(89)90144-7

Botnmark, D., Kvalnes, S., & Svartdal, F. (2014). Prokrastinering—hvorfor studenter utsetter ting og hvordan utsettelse påvirker velvære og helse [Why students postpone things, and how this affects health and well-being]. *Tidsskrift for Norsk Psykologforening, 51,* 616–623.

Britton, B. K., & Tesser, A. (1991). Effects of time-management practices on college grades. *Journal of Educational Psychology, 83*(3), 405. doi:10.1037/0022-0663.83.3.405

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

Fee, R. L., & Tangney, J. P. (2000). Procrastination: A means of avoiding shame or guilt?. *Journal of Social Behavior and Personality, 15*(5), 167.

Ferrari, J. R., Johnson, J. L., & McCown, W. G. (1995). *Procrastination Research* (pp. 21–46). Springer US. doi:10.1007/978-1-4899-0227-6_2

Flett, G. L., Blankstein, K. R., & Martin, T. R. (1995). Procrastination, negative self-evaluation, and stress in depression and anxiety. In *Procrastination and Task Avoidance* (pp. 137–167). Springer US. doi:10.1007/978-1-4899-0227-6_7

Gallagher, R. P., Golin, A., & Kelleher, K. (1992). The personal, career, and learning skills needs of college students. *Journal of College Student Development*, *33*(4), 301–309.

Gustavson, D. E., Miyake, A., Hewitt, J. K., & Friedman, N. P. (2014). Genetic relations among procrastination, impulsivity, and goal-management ability implications for the evolutionary origin of procrastination. *Psychological Science*, *25*(6), 1178–1188.

doi:10.1177/0956797614526260

Häfner, A., Oberst, V., & Stock, A. (2014). Avoiding procrastination through time management: an experimental intervention study. *Educational Studies*, *40*(3), 352–360. doi:10.1080/03055698.2014.899487

Haug, I. M. (2016). *Measuring Procrastination: Validation of a semi-behavioral measure*. Master thesis.

Hellsten, L. A. M., & Todd Rogers, W. (2009). Development and preliminary validation of the Time Management for Exercise Scale. *Measurement in Physical Education and Exercise Science*, *13*(1), 13–33. doi:10.1080/10913670802609128

Höcker, A., Engberding, M., Haferkamp, R., & Rist, F. (2012). Effectiveness of working time restriction in the treatment of procrastination. *Verhaltenstherapie*, 22, 9–16. doi:10.1159/000334970

Job, V., Walton, G. M., Bernecker, K., & Dweck, C. S. (2015). Implicit theories about willpower predict self-regulation and grades in everyday life. *Journal of Personality and Social Psychology, 108*(4), 637. doi:10.1037/pspp0000014

Karas, D., & Spada, M. M. (2009). Brief cognitive-behavioural coaching for procrastination: A case series. *Coaching: An International Journal of Theory, Research and Practice*, *2*(1), 44–53. doi:10.1080/17521880802379700

Lamwers, L. L., & Jazwinski, C. H. (1989). A comparison of three strategies to reduce student procrastination in PSI. *Teaching of Psychology*, *16*(1), 8–12. doi:10.1207/s15328023top1601_2

Lee, E. (2005). The relationship of motivation and flow experience to academic procrastination in university students. *The Journal of Genetic Psychology*, *166*(1), 5–15. doi:10.3200/GNTP.166.1.5-15

Neenan, M. (2008). Tackling procrastination: A REBT perspective for coaches. *Journal of Rational-Emotive Behavioural Therapy, 26*, 53–62. doi:10.1007/s10942-007-0074-1

Ozer, B. U., Demir, A., & Ferrari, J. R. (2013). Reducing academic procrastination through a group treatment program: A pilot study. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *31*(3), 127–135. doi:10.1007/s10942-013-0165-0

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

Pychyl, T. A., Lee, J. M., Thibodeau, R., & Blunt, A. (2000). Five days of emotion: An experience sampling study of undergraduate student procrastination. *Journal of Social Behavior and Personality*, *15*(5), 239.

Pychyl, T. A., & Flett, G. L. (2012). Procrastination and self-regulatory failure: An introduction to the special issue. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *30*(4), 203–212. doi:10.1007/s10942-012-0149-5

Rabin, L. A., Fogel, J., & Nutter-Upham, K. E. (2011). Academic procrastination in college students: The role of self-reported executive function. *Journal of Clinical and Experimental Neuropsychology*, *33*(3), 344–357. doi:10.1080/13803395.2010.518597

Roberts, M. S., Fulton, M., & Semb, G. (1988). Self-pacing in a personalized psychology course: Letting students set the deadlines. *Teaching of Psychology*, *15*(2), 89–92. doi:10.1207/s15328023top1502_5

Rozental, A., Forsell, E., Svensson, A., Andersson, G., & Carlbring, P. (2015). Internet-Based Cognitive-Behavior Therapy for Procrastination: A Randomized Controlled Trial. doi:10.1037/ccp0000023

Scent, C. L., & Boes, S. R. (2014). Acceptance and Commitment Training: A brief intervention to reduce procrastination among college students. *Journal of College Student Psychotherapy*, *28*(2), 144–156. doi:10.1080/87568225.2014.883887

Schmitz, B., & Wiese, B. S. (2006). New perspectives for the evaluation of training sessions in self-regulated learning: Time-series analyses of diary data. *Contemporary Educational Psychology*, *31*(1), 64–96. doi:10.1016/j.cedpsych.2005.02.002

Schraw, G., Wadkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. *Journal of Educational Psychology*, *99*(1), 12. doi:10.1037/0022-0663.99.1.12

Sirois, F. M. (2014). Procrastination and stress: Exploring the role of self-compassion. *Self and Identity*, *13*(2), 128–145. doi:10.1080/15298868.2013.763404

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

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

Steel, P., & Ferrari, J. (2013), Sex, education, and procrastination: An epidemiological study of procrastinators' characteristics from a global sample. *European Journal of Personality*, *27*, 51–58. doi:10.1002/per.1851

Steel, P., & Klingsieck, K. B. (2016). Academic procrastination: Psychological antecedents revisited. *Australian Psychologist*, *51*(1), 36–46. doi:10.1111/ap.12173

Stöber, J., & Joormann, J. (2001). Worry, procrastination, and perfectionism: Differentiating amount of worry, pathological worry, anxiety, and depression. *Cognitive Therapy and Research*, *25*(1), 49–60. doi:10.1023/A:1026474715384

Svartdal, F. (2015). Measuring procrastination: Psychometric properties of the Norwegian versions of the Irrational Procrastination Scale (IPS) and the Pure Procrastination Scale (PPS). *Scandinavian Journal of Educational Research*, 1–13. doi:10.1080/00313831.2015.1066439

Tice, D. M., & Bratslavsky, E. (2000). Giving in to feel good: The place of emotion regulation in the context of general self-control. *Psychological Inquiry*, *11*(3), 149–159. doi:10.1207/S15327965PLI1103_03

Tuckman, B. W. (1998). Using tests as an incentive to motivate procrastinators to study. *The Journal of Experimental Education*, *66*(2), 141–147. doi:10.1080/00220979809601400

Tuckman, B. W. & Kennedy, G. J. (2011). Teaching learning strategies to increase success of first-term college students. *Journal of Experimental Education, 79*, 478–504. doi:10.1080/00220973.2010.512318

Wäschle, K., Lachner, A., Stucke, B., Rey, S., Frömmel, C., & Nückles, M. (2014). Effects of visual feedback on medical students' procrastination within web-based planning and reflection protocols. *Computers in Human Behavior*, *41*, 120–136. doi:10.1016/j.chb.2014.09.022

Wesp, R. (1986). Reducing procrastination through required course involvement. *Teaching of Psychology*, *13*(3), 128–130. doi:10.1207/s15328023top1303_6

Ziesat Jr., H. A., Rosenthal, T. L., & White, G. M. (1978). Behavioral self-control in treating procrastination of studying. *Psychological Reports*, *42*(1), 59–69. doi:10.2466/pr0.1978.42.1.59

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Abstract

Intervention to reduce procrastination in first-year students: Preliminary results from a Norwegian study

This paper reports preliminary results from a brief intervention designed to reduce academic procrastination. Students enrolled in an introductory psychology course received lectures and seminar sessions about procrastination and its causes and consequences. Students who were enrolled in an introductory psychology course

received lectures and seminar sessions about procrastination and its causes and consequences, as well as information about techniques that are helpful in reducing and preventing the problem. Changes in procrastination and techniques helpful in reducing procrastination were monitored in pre and post probes. Results indicated that students reduced their procrastination, with the most positive changes observed in students who were high in procrastination tendencies at the outset of the intervention.

Keywords: academic procrastination, intervention, students.

Author affiliations: Kent Nordby, Catharina Elisabeth Arfwedson Wang, Tove Irene Dahl & Frode Svartdal – UiT the Arctic University of Norway, Tromsø, Norway.

Contact information: Frode Svartdal, Department of Psychology, UiT the Arctic University of Norway, N-9037 Tromsø, Norway. Email: frode.svartdal@uit.no.

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Do procrastination-friendly environments make students delay unnecessarily?

Kent Nordby[1] · **Katrin B. Klingsieck**[2] · **Frode Svartdal**[1]

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Abstract Research on procrastination emphasizes trait explanations for unwanted delay, yet environmental factors are most probably significant contributors to the problem. In this paper, we review literature related to the influence of environmental factors on academic procrastination and investigate how such factors may be assessed in facilitating academic procrastination in students. Study 1 asked students to evaluate three different fields of study—natural sciences, medicine, and humanities—on environmental variables assumed to be relevant for academic procrastination (e.g., structured course progression, freedom in the study situation). Distinct differences between the academic fields were observed. In Study 2, participants from these three fields of study rated their own academic procrastination as well as peer procrastination and peer influence. Dispositional (trait) procrastination was also measured. The results demonstrated that environmental factors have a negligible impact on low-procrastinating students, whereas procrastination-friendly environments seem to facilitate and augment academic procrastination in students at medium-level dispositional procrastination, i.e., the majority of students. We conclude that social and environmental factors should receive increased attention in measures taken to reduce and prevent academic procrastination.

Keywords Academic procrastination · Peer effects · Procrastination environment · Procrastination antecedents · Self-control

✉ Frode Svartdal
frode.svartdal@uit.no

[1] Department of Psychology, UiT the Arctic University of Norway, 9037 Tromsø, Norway

[2] Department of Psychology, Universität Paderborn, Paderborn, Germany

1 Introduction

The goal of the present study is to explore the role of environmental factors in academic procrastination by focusing on culture differences between different academic disciplines, peer procrastination, and peer influence. Academic procrastination—the intentional delay of initiation or completion of important and timely academic activities (Ziesat et al. 1978)—is common among students. The core characteristic of procrastination is the intention-action-gap (Steel 2007): Procrastinators demonstrate no lack of good intentions, but too often intentions are not implemented as planned (Dewitte and Lens 2000). As much as 50% of students procrastinate to the extent that it becomes problematic (Solomon and Rothblum 1984; Steel 2007). Academic procrastination typically manifests itself as delay in starting or finishing academic tasks such as studying for exams, writing term papers, and keeping up with weekly assignments. Such delays result in suboptimal performance in meeting deadlines (Ellis and Knaus 1977; Pychyl et al. 2000; Steel 2007), and are accompanied by discomfort and stress (Sirois 2014), depression and anxiety (Flett et al. 1995; Stöber and Joormann 2001), worry (Antony et al. 1998; Ferrari et al. 1995), and shame and guilt (Fee and Tangney 2000; Pychyl et al. 2000).

Most research on procrastination has focused on the dispositional accounts of the problem. Indeed, procrastination is referred to as the "quintessential self-regulatory failure" (Steel 2007), and the notion of a "procrastinator" identifies procrastination as essentially a personal problem. In support of this view, a large body of research has investigated the relation between personality dimensions and procrastination, demonstrating the close connection between procrastination and impulsiveness, low conscientiousness, and lack of self-control (Gustavson et al. 2014; Ozer and Benet-Martinez 2006; Rozental and Carlbring 2014; Steel 2007). Such findings accentuate the stereotypical picture of the procrastinating student as a person who is easily distracted by tempting activities such as socializing with friends or surfing the Internet, demonstrating little concern for academic work. Additionally, students with high levels of evaluation anxiety, maladaptive perfectionism, low self-efficacy, and fear of failure have been found to have problems with writing term papers, studying for exams, and keeping up with weekly readings due to procrastination (Alexander and Onwuegbuzie 2007). Research has further demonstrated that low extrinsic motivation and external locus of control contribute to academic procrastination (Brownlow and Reasinger 2000), whereas high intrinsic motivation reduces it (Lee 2005; Steel 2007). Negative metacognitive beliefs about procrastination (e.g., thoughts about the uncontrollability of procrastination) tend to increase unnecessary delay (Fernie et al. 2009), as do positive beliefs such as "procrastination helps creative thinking" or "I work better under pressure" (Cao 2012).

1.1 Environmental factors in procrastination

As discussed, research over the past four decades has amply demonstrated that individual factors significantly contribute to the procrastination problem. In contrast, environmental (exogenous) factors have received considerably less attention. This is surprising, given the fact that being a student is an inherently social endeavor, and that a multitude of social and environmental factors beyond the students' control may create and sustain unnecessary delay. In the following paragraphs, we review research concerning exogenous factors that foster procrastination. Due to the relative scarcity of this research, we have also included some relevant findings from outside the field of procrastination.

1.1.1 Teacher/instructor effects

Several studies have documented how teachers and instructors can affect learning and achievement (Corkin et al. 2014; Sacerdote 2011), and how effective teachers can make students feel better about school and learning as well as enhance student achievement (Darling-Hammond 2000). A few studies have investigated how teachers directly affect student procrastination. For example, Corkin et al. (2014) found that procrastination was inversely related to instructor organization, possibly because instructors who are organized "make it easier for students to organize, structure, and plan their own work" (Corkin et al. 2014, p. 299). Similar results were reported in a qualitative study where students indicated unorganized and lax teachers to be a reason for their procrastination (Grunschel et al. 2013), whereas instructors with high expectations have been found to increase students' class enjoyment and interest and reduce student procrastination (Corkin et al. 2014). Similarly, teachers who expect less, are more flexible in their grading, and are willing to negotiate deadlines with students have been found to promote procrastination (Schraw et al. 2007). Patrzek et al. (2012) interviewed 12 experienced university counselors who work with students struggling with procrastination. Although these counselors highlighted the importance of dispositional aspects and task characteristics as important causes of procrastination, they also emphasized the negative effect of poor teaching skills and coaching in lecturers and overwhelming amounts of work put on students by the universities. Concerning deadlines, several studies have shown that instructors who set deadlines help students reduce their procrastination and increase their performance, compared to students with self-imposed deadlines (Grunschel et al. 2013; Lamwers and Jazwinski 1989; Wesp 1986). Accordingly, several authors recommend setting strict deadlines for students to reduce procrastination (Ariely and Wertenbroch 2002; Steel 2007; Tuckman and Schouwenburg 2004).

1.1.2 Task characteristics

Task characteristics are important for evoking and maintaining procrastination. As many study-related tasks are imposed on students by others, they represent an important environmental context for student procrastination. *Task aversiveness*, i.e.,

the degree to which a task is unpleasant, boring, and/or uninteresting, is a strong predictor of procrastination (Steel 2007). Blunt and Pychyl (2000) found different aspects of task aversiveness to be important at different stages of personal projects. During the initial startup stages of a project, task aversiveness is related to aspects of personal meaning such as project enjoyment, pleasure, fun, and communion, whereas later on the feeling of control, initiating work, and feeling of uncertainty play a greater role in the perception of aversiveness. Several studies have found *task difficulty* to be important. On the one hand, the more difficult the task, the more students tend to procrastinate (Scher and Ferrari 2000; Senécal et al. 1997). On the other hand, if the task is too easy, it can promote procrastination by appearing boring or uninteresting. Thus, a balance between making a task sufficiently challenging but also achievable seems to be optimal (Steel 2007; van Eerde 2000). Ackerman and Gross (2005) found that students procrastinated less on assignments perceived as interesting, required a variety of skills to complete, were accompanied with clear instructions, and were carried out in a milieu with social norms and rewards for starting promptly.

1.1.3 Social environment and peers

Another possibly important factor in procrastination is the role of the social environment and peers (Klingsieck et al. 2013). Klingsieck et al. (2013) noted that "…it seems especially surprising that previous research has virtually neglected social aspects of procrastination." This conclusion may be particularly relevant for students since they interact with other students on a daily basis, both in academic settings and in their free time, creating arenas for modeling and other forms of social influence. Based on interviews with students, Klingsieck et al. (2013) found a three-category divide in social antecedents for procrastination: (1) group tasks versus individual tasks, (2) significant others' attitudes toward procrastination, and (3) procrastinating role models. Students reported procrastinating less when collaborating with others. They also reported that family and friends served as role models for procrastination tendencies (e.g., "because my sisters are very similar with regard to procrastination") and that the influence of significant others depended on both the attitude to procrastination and the model.

These categories are also in line with social psychological research. For example, according to the social facilitation hypothesis, the mere presence of others can speed up or slow down performance, depending on individual skill (Falk and Ichino 2006; Zajonc and Sales 1966). Also, other students may serve as good or bad models (Bandura 1977) depending on behavior and consequences relating to procrastination (Stinebrickner and Stinebrickner 2006). Third, according to social comparison theory (Festinger 1964), people evaluate themselves by comparing with others. To avoid feeling less capable or intelligent than their peers, students might feel obligated to work harder to keep up. Finally, research indicates that procrastinators may have good reason to believe they are being judged negatively by others. Thus, Ferrari and Patel (2004) found that across academic and everyday activities, procrastinators punish other procrastinators by allocating procrastinating peers

fewer resources, giving them lower ratings, and attributing more internal negative dispositions to them.

Outside the field of procrastination research, peer effects have been investigated by examining student academic performance related to that of their close peers. The assumption is that pairing students with academically stronger peers will have a positive performance impact on the weaker peers. Coleman and Department of Health USA (1966) found the expected presence of peer effects in elementary and secondary school, concluding that "…a pupil's achievement is strongly related to the educational backgrounds and aspirations of the other students in the school." However, results from studies in higher education have rendered mixed results (Carrell et al. 2009; Sacerdote 2011). For example, Zimmerman (2003), using random assignment of housing for students, found only small positive effects for students in the middle 70% of the distribution, but no peer effects at all for the top and bottom 15%. Similarly, Foster (2006), Lyle (2007) and Stinebrickner and Stinebrickner (2006) found no or weak evidence for contextual peer effects on academic grades. In contrast, Hoxby and Weingarth (2005) demonstrated strong peer effects for the top and bottom 15% students in their sample, and smaller effects in the middle of the distribution, concluding that "higher achieving people are better peers all else equal." Carrell et al. (2009), studying a sample from the United States Air Force Academy, found that the SAT score of peers influenced weaker peers' outcomes on some topics (i.e., math and science), but not on others (i.e., physical education and language).

Research on peer effects also indicates an impact on students' procrastination behavior. For example, Foster and Frijters (2010) found that students believed that high-quality peers could positively influence their outcomes and that their effort levels depended on the effort level of their peers. Similarly, Stinebrickner and Stinebrickner (2006) found that first-year grade outcomes and drop-out decisions depended partly on the effort students put into studying, the quality of their study time, and students' beliefs about the importance of education and that their peers could influence these effects. In addition, working with peers has been shown to have motivational effects on students (Eisenkopf 2009), possibly playing an important role in student procrastination.

1.2 Evaluation

Reviewing the literature leaves the impression that environmental and social factors may be important in facilitating or hindering procrastination, but it is difficult to formulate clear-cut conclusions about their effects. One reason for this is that social and environmental factors affect people in complex ways, often interacting with dispositional factors. For example, students prone to procrastinate may "thrive" in a procrastination-friendly environment (e.g., peers are procrastinating, teachers are lax), causing them to feel very little pressure to get things done, whereas students low in procrastination might react to the same environment in an opposite way, attempting to distinguish themselves from their less diligent peers. Second, environments are diverse. Within any single student group, some students procrastinate, whereas others do not, putting any one student in contact with a

variety of different influences, possibly making a given environment both procrastination-friendly and unfriendly at the same time. This diversity also presents possibilities for individual students to self-select into peer groups within a larger study environment, making it difficult to distinguish peer-effects from selection effects. Third, factors inhibiting versus promoting procrastination in a given context may be additive or interactive, implying that a given factor may be unimportant or important depending on other factors. Accordingly, an examination of the effects of environmental factors on procrastination should be prepared for complexity, taking into account also that their effects most probably will be modulated by the dispositional tendency to procrastinate in a given student.

Importantly, existing research has not examined the role of study content and academic climate related to procrastination. Characteristics of different academic disciplines might differentially affect how students behave and think in relation to delay. For example, study environments may differ as to whether they are competitive and outcome-focused, or whether they emphasize specific knowledge and skills rather than understanding and reflection. Schachter et al. (1991, p. 362) found that lecturers in different study topics differed in their lecture styles as to whether skills and knowledge can be described accurately or not:

> The academic disciplines differ markedly in the extent to which, let us say, a speaker is required to choose among options in an undergraduate introductory lecture. In the pure sciences, we maintain, there are relatively few options. Consider a statement such as $E = mc^2$. There are no options; it cannot be c^3 or c^4; it is mc^2 and that is it. In contrast, consider the statement, "What Shakespeare probably meant in that passage from Lear was …" or "The reason Jackson Pollack put the patch of red in the corner of the canvas was …" The options seem limitless.

Such differences may be accompanied by structural and cultural differences in the study curriculum, for example in the degree of freedom of the study situation, the way exams are arranged, the types of knowledge and competence tested, and more (e.g., Becher 1994). We are not aware of studies documenting the existence of such procrastination-relevant differences as perceived by students, but we find it likely that structural and cultural differences between academic disciplines are associated with overall differences in student procrastination. As noted, it is also likely that structural and cultural differences between academic disciplines may act differently, depending on individual procrastination level.

1.3 The present studies

The goal of the present study was to explore the role of environmental factors in academic procrastination by focusing on culture differences between different academic disciplines, peer procrastination, and peer influence. Study 1 examined structural and cultural differences between three academic disciplines, natural sciences, medicine, and humanities as perceived by students. Based on the literature reviewed, we identified six dimensions believed to be particularly relevant for academic procrastination (Becher 1994; Schachter et al. 1991): *Rote learning and*

memorizing, *tangible knowledge*, *reflection and afterthought*, *structured course progression*, *high demands and grade pressure*, and *freedom in the study situation*. In evaluating these dimensions, we expected students to rate the humanities high on the dimensions such as *reflection and afterthought* and *freedom in the study situation*, and low on dimensions such as *rote learning and memorizing* and *tangible knowledge*. Natural sciences, and to some extent medicine, should be evaluated in an opposite way. If correct, such differences between the three selected academic disciplines represent procrastination-relevant dimensions that present differential opportunities for students to procrastinate.

Study 2 examined academic procrastination among students from these three academic disciplines. Assuming that structural and cultural differences between the disciplines are related to procrastination, overall differences in academic procrastination should be observed, with more procrastination in procrastination-friendly environments. More importantly, study environments should affect students differently, depending on dispositional tendency to procrastinate. Thus, a student low in procrastination should be relatively little influenced by a procrastination-friendly environment, whereas students higher in dispositional procrastination should be negatively affected. Finally, to examine possible peer effects, we also assessed the extent to which peers were perceived to procrastinate and the extent to which a given student was influenced by peers.

2 Study 1

Study 1 asked students to evaluate three different academic disciplines on six dimensions assumed to facilitate versus hinder procrastination. We chose the academic disciplines *natural sciences*, *medicine,* and *humanities*, as we believe these to demonstrate distinctly different characteristics on the six dimensions specified. For example, medicine and natural sciences are characterized by a pragmatic and factual approach to learning, whereas humanities can be characterized by a more reflective and contemplative approach. It is also likely that these differences are reflected in the structure of study progression.

2.1 Method

2.1.1 Participants

Participants were 49 students (mean age = 24.3 years, $SD = 3.70$) at a Norwegian university. Most (43) were from natural sciences, medicine, and humanities.

2.1.2 Material

The questionnaire described six dimensions describing natural sciences, medicine, and humanities. The six dimensions were *rote learning and memorizing*, *tangible knowledge*, *reflection and afterthought*, *structured course progression*, *high demands and grade pressure*, and *freedom in the study situation*. Each dimension

was rated on a 5-point Likert-scale (1–5), higher scores indicated the dimension to be more characteristic of the academic field. The academic fields were rated in sequence, natural science first, then medicine, and finally humanities.

2.2 Results

Comparing the mean dimension evaluations between the study programs indicated a significant interaction effect, $F(10, 480) = 35.67$, $p < .00$, partial eta squared = .43. As is seen from Table 1, natural sciences and medicine were evaluated as higher on the dimensions *rote learning and memorizing*, *tangible knowledge*, and *structured course progression*, whereas evaluations of humanities were higher on the dimensions *reflection and afterthought* and *freedom in the study situation*. Note also that medicine was evaluated very high on *high demands/grade pressure*, reflecting the fact that this study program has very high grade admission demands. The mean of all dimensions (all except dimensions 3 and 6 reversed) can be seen as a measure of "procrastination-friendliness." Comparing the study fields on these means rendered a significant difference, $F(2, 96) = 113.46$, $p < .00$, natural science and medicine being evaluated low in the scale (2.47 and 2.09, respectively) and humanities as markedly higher (3.51).

2.3 Discussion

The present results demonstrate distinct differences between the three study fields, indicating that students in these fields have different beliefs, expectations, and attitudes that are likely to facilitate versus hinder procrastination. Whether such structural and climate differences affect procrastination in students enrolled in the programs is not known from the present data, but we find it likely. For example, against the backdrop of research concerning situational aspects of procrastination, freedom in the study situation, the need for reflection and afterthoughts, and lack of structured course progression are all factors that are likely to facilitate procrastination, at least in people prone to delay unnecessarily in the first place. Hence, as is apparent from Table 1, the profile describing the humanities makes that study

Table 1 Culture differences in study programs

Dimensions	Natural Sciences		Medicine		Humanities	
	M	*SD*	*M*	*SD*	*M*	*SD*
1. Rote learning/memorizing	3.65	1.03	4.53	.71	3.02	1.05
2. Tangible knowledge	4.06	.94	4.20	.89	2.78	1.01
3. Reflection/afterthoughts	3.14	1.17	3.51	1.14	4.41	.84
4. Structured course progression	4.04	.84	4.47	.68	2.92	1.12
5. High demands/grade pressure	3.74	1.00	4.22	1.20	2.82	.88
6. Freedom in the study situation	3.16	1.20	2.45	1.14	4.18	.81

program potentially more procrastination-friendly compared to both medicine and natural sciences.

3 Study 2

The aim of Study 2 was to examine the relation between procrastination-relevant environmental factors and academic procrastination. Procrastination-relevant environmental factors are conditions that facilitate (or hinder) individual procrastination, such as the organization of the study situation, unstructured (or structured) coursework, study content, procrastinating (or non-procrastinating) peers, as well as other variables. As indicated in Study 1, several of these factors seem to be distinctly different between the academic disciplines natural sciences, medicine, and humanities. Hence, we recruited participants from these three disciplines for Study 2. To examine procrastination, we administered the Irrational Procrastination Scale (IPS; Steel 2010) as well as a scale measuring specific instances of academic procrastination. The first scale addresses dispositional procrastination, whereas the latter focuses on socially-induced episodes of doing something else that planned academic work, e.g., "When I am with other students to do schoolwork, we often end up doing other things instead." We also administered items to assess *peer procrastination*, *peer influence*, and *exposure* to the student environment.

Given these measures, the study attempted to assess the influence of environmental and social factors on academic procrastination. Here it is of great interest to examine if and how there are differences between academic disciplines related to procrastination-relevant factors, and if such differences are modulated by dispositional tendency to procrastinate. No or small differences in academic procrastination were expected between academic disciplines for well-regulated students scoring low in dispositional procrastination. However, for students demonstrating medium or high procrastination as defined by the dispositional IPS measure, study programs with characteristics that facilitate procrastination (i.e., humanities in the present study), should be associated with significantly more academic procrastination compared to programs low on these dimensions (i.e., medicine and natural sciences).

Furthermore, as peers may facilitate or reduce procrastination in a given student through their procrastination habits, peer procrastination may be an important factor in understanding academic procrastination. We obtained a measure of peer procrastination by asking the participants to evaluate procrastination in fellow students, e.g., "My fellow students rarely delay schoolwork." In the present context, peer procrastination should at least in part be a function of the different study disciplines, with overall more peer procrastination in humanities compared to natural sciences and medicine. However, this overall tendency may be modulated by a given student's own dispositional tendency to procrastinate. For example, students prone to procrastination may prefer to interact with other students also prone to procrastination, or they may simply have been excluded from groups consisting of low-procrastinating students. We also find it likely that students will evaluate their peers in a somewhat egocentric manner, evaluating others differently depending on

their own procrastination level (i.e., a false consensus effect). Hence, students low in dispositional procrastination should report less procrastination among peers compared to students high in dispositional procrastination. If correct, such selective or biased perception of peers may modulate own academic procrastination in positive or negative directions, the most detrimental scenario being that students already prone to procrastination may be negatively influenced by procrastinating peers. Finally, we also included items to assess *exposure to the study environment*. Exposure might be a moderating factor for environmental factors. Clearly, students working extensively at home are less exposed to environmental factors affecting procrastination. Hence their effect should be reduced.

3.1 Method

3.1.1 Participants

A total of 215 students (137 females) from a Norwegian university participated. Mean age was 22.0 years ($SD = 4.69$). Participants were recruited from three different fields of study: natural sciences (n = 51, mean age = 22.3), medicine (n = 113, mean age = 21.1), and social sciences/humanities (51, mean age = 23.8), during the middle of the fall and spring semesters. In medicine and natural sciences, the majority of the sample consisted of students in their first year at the university (81.4 and 70.6% respectively), while in social sciences/humanities 35.3% of students were in their first year of university and the rest studied two or more semesters. Participants from medicine consisted of a mix of students studying to become either medical doctors or dentists; participants from natural sciences consisted of students studying computer programming and engineering as an open course or part of a bachelor program. Participants from humanities consisted of a mix of students studying either religion, pedagogics or English language as an open course or part of a bachelor program.

3.1.2 Materials

3.1.2.1 Irrational procrastination scale The IPS (Steel 2010) consists of nine items (e.g., "I put things off so long that my well-being or efficiency unnecessarily suffers"), three of which are reversely coded (e.g., "I do everything when I believe it needs to be done"). Items are rated on a five-point Likert-scale (1–5), with higher scores indicating more procrastination. The IPS has good internal consistency with a Cronbach's alpha of .93, and a test–retest reliability coefficient of .68 (Steel 2010). The Norwegian version was translated and validated by Svartdal (2015), with good internal consistency (Cronbach's $\alpha = .85$–.91). In the present study, $\alpha = .92$.

3.1.2.2 Socially-induced academic procrastination (SIAP) This is a measure of academic procrastination behavior focusing on self-control in the face of tempting social activities, given an intention to do academic work. Three items addressed this construct, e.g., "When I am at the university to work, I often get distracted by

activities with my fellow students." See Appendix for full list of items. Items are rated on a five-point Likert-scale (1–5), a higher score indicating higher social impulsiveness. Item-test correlations ranged from .73 to .81. For these items, Cronbach's alpha was .68.[1] Evaluation of this and the following constructs was also performed by confirmatory factor analysis (CFA; Brown 2015; Kline 2016), testing each measure assuming unidimensional latent constructs. Measurement model fit was excellent, RMSEA = .000, CFI = 1.000, SRMR = .000.

3.1.2.3 Peer procrastination This construct consisted of four items related to peer culture to procrastinate (or not to procrastinate), e.g., "There is a culture among my fellow students to delay exams-reading and starting writing assignments," and "My fellow students rarely delay schoolwork." All items are presented in "Appendix". Items are rated on a five-point Likert-scale (1–5), higher score implying higher procrastination. Two items were reversed, giving an overall index with increasing values implying increasing procrastination among peers. Item-test correlations ranged from .65 to .74, and Cronbach's alpha for the selected items was .68. For peer procrastination, the measurement model fit was good, RMSEA = .043, CFI = .994, SRMR = .023.

3.1.2.4 Peer influence For this measure, six items related to comparison to others were included, e.g., "I work harder when I know I am behind my fellow students" and "When I am late with my schoolwork, I find it reassuring that other students are also behind in their work." Items are rated on a five-point Likert-scale (1–5), higher score implying a higher degree of peer influence. In contrast to the peer procrastination measure, these items do not assess level of procrastination but instead the regulation of own behavior when comparing to other students. Item-test correlations ranged from .58 to .75. Cronbach's alpha for these items was .65, and measurement model fit to the expected unidimensional construct was acceptable, RMSEA = .074, CFI = .961, SRMR = .047.

3.1.2.5 Exposure Three items measured the extent to which the student spent time at the university, as well as social integration, e.g., "I spend a lot of time at the university" and "I often hang out with fellow students." Item-test correlations ranged from .75 to .84. Cronbach's alpha for these items was .69 and measurement model fit to the expected unidimensional construct was excellent, RMSEA = .000, CFI = 1.000, SRMR = .000.

3.2 Procedure

Students were recruited using convenience sampling from courses described in the methods section. The students present at the lectures were asked to fill out a web-based questionnaire (www.qualtrics.com) between lectures, while students who

[1] The relatively low alphas reported here are probably due to low number of items (e.g., Streiner 2003) as well as relatively heterogeneous subsamples. Hence, we supplement alphas with estimates of measurement fits using CFA.

were not attending lectures were asked to follow a link to the questionnaire posted on the course forum. All were informed that participation was voluntary and responses were given anonymously. The main project of which the current study is part received ethical approval from the Regional Ethical Board in Tromsø, Norway (REK Nord 2014/2313).

3.3 Statistical analysis

Descriptive and correlational analyses were performed to examine the relations between *socially-induced academic procrastination* (SIAP), *peer procrastination*, *peer influence*, *dispositional procrastination* (IPS), as well as *exposure*. In the next step, we performed an ANOVA (GLM) with study programs (natural sciences, medicine, and humanities) and levels of dispositional procrastination (low, medium, and high) as between-group predictor variables, and SIAP, peer procrastination, peer influence, and exposure as dependent variables. In this way, profiles could be compared between study programs and over three procrastination levels. Predicted differences were tested by contrast analyses. In the third step, these variables were entered in a regression analysis with SIAP as a dependent variable and the other variables as predictors, both across academic disciplines and within each discipline. In these analyses, Statistica (www.statsoft.com) was used.

3.4 Results and discussion

Means, standard deviations, and correlations between the indices are shown in Table 2. As expected, the correlation between socially-induced academic procrastination (SIAP) and IPS was relatively high, $r = .48$, but the shared variance between these variables, 22.5%, indicates that most of the variance in SIAP is independent of IPS. For the three study programs, the IPS - SIAP correlations were $r = .65$ (natural science), .37 (medicine), and .46 (humanities). SIAP correlated relatively equally with the peer influence and peer procrastination measures, $r = .40$ and .37. The mean IPS score for the natural sciences was 3.02 ($SD = .88$), for medicine 2.80 ($SD = .72$), and for humanities 3.22 ($SD = .75$), $F(2, 212) = 6.91$, $p = .001$, medicine demonstrating somewhat lower scores compared to the natural sciences and humanities.[2]

3.4.1 Socially-induced procrastination (SIAP)

An overall ANOVA demonstrated a significant effect of study environment on SIAP, $F(2, 212) = 9.87$, $p < .00$, natural sciences demonstrating the lowest SIAP (2.60) and humanities the highest (3.24). SIAP was examined over the three study fields and over different levels of dispositional procrastination. We expected that procrastination-friendly academic disciplines affect students differentially, depending on dispositional procrastination. Thus, at low dispositional procrastination level, differences in study environment should make little difference for SIAP scores.

[2] In an aggregated sample of 1015 Norwegian students, the mean IPS score was 3.20 (Svartdal 2015).

Table 2 Correlations, means, and standard deviations for the measures

Measure	*M*	*SD*	1	2	3	4
1. Peer procrastination	2.66	.63	1.00			
2. Peer influence	3.38	.73	.06	1.00		
3. Exposure	3.23	.82	−.28*	.16*	1.00	
4. Socially-induced acad. procrastination (SIAP)	2.85	.78	.40*	.37*	−.06	1.00
5. Irrational procrastination scale (IPS)	2.94	.79	.37*	.33*	−.34*	.48*

* $p < .01$

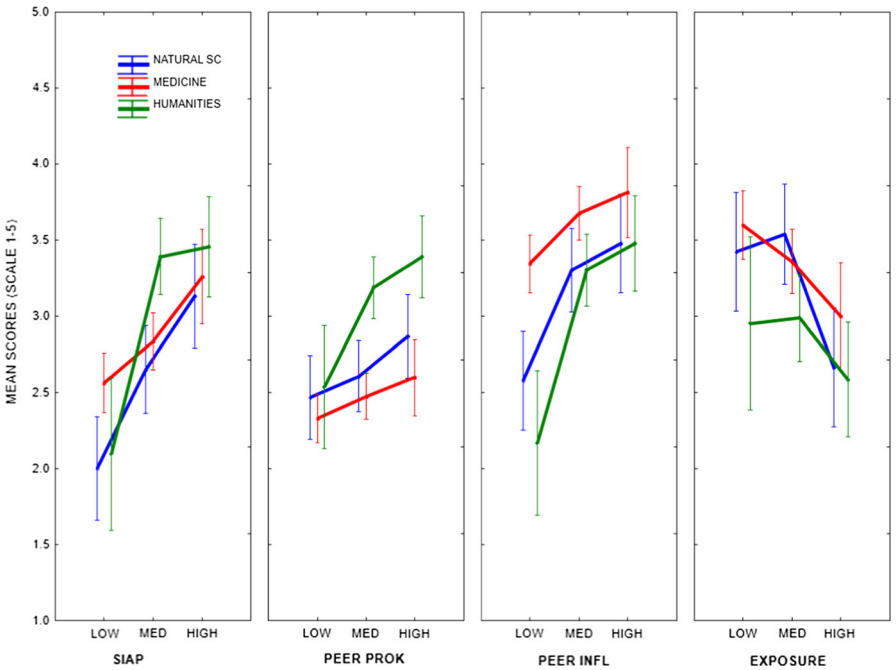

Fig. 1 Mean scores for *socially-induced procrastination* (SIAP), *peer procrastination*, *peer influence*, and exposure over different levels of procrastination (IPS low, medium, and high) in the three different study programs

However, at higher procrastination levels, procrastination-friendly study environments (humanities in the present context) should negatively affect SIAP scores compared to procrastination-unfriendly environments (natural sciences, medicine). To test this expectation, we compared mean SIAP scores over IPS level (low ≤ 2.5; medium $> 2.5 < 3.5$; high ≥ 3.5) in the three different fields of study. The first expectation is illustrated in Fig. 1, leftmost panel. Here, low-procrastinating students (low IPS) demonstrated low SIAP scores regardless of field of study, with no difference between the humanities versus natural sciences and medicine, $F(1, 206) = .47$, $p = .49$. The corresponding contrast at medium IPS level demonstrated

a significant difference in SIAP scores, $F(1, 206) = 17.96$, $p < .00$, humanities demonstrating higher scores compared to medicine/natural sciences as predicted. Also at high IPS level, students from the humanities demonstrated high SIAP scores compared to medicine and the natural sciences, but not significantly different, $F(1, 206) = 1.65$, $p = .20$. Importantly, as medium IPS level is typical procrastination for students (Svartdal 2015; Svartdal et al. 2016), this result indicates that the study environment is of importance for the majority of students. For low or non-procrastinators or high procrastinators (high IPS level), study environment does not appear to make much of a difference for socially-induced academic procrastination (SIAP).

3.4.2 Peer procrastination

An overall ANOVA of *peer procrastination* over the three study fields indicated a significant effect, $F(2, 212) = 29.66$, $p < .00$, reflecting that medicine and natural sciences demonstrated lower means (2.44 and 2.26, respectively) compared to humanities (3.16). As is apparent from Fig. 1, no difference between the study programs appeared at low IPS level, $F(1, 206) = .40$, $p = .53$. However, as predicted, contrast analyses indicated that the humanities scored significantly higher compared to natural sciences and medicine at higher IPS levels, $F(1, 206) = 27.12$, $p < .00$ (medium IPS) and $F(1, 206) = 15.92$, $p < .00$ (high IPS). Overall peer procrastination scores increased over IPS levels, from 2.44 to 2.95, $F(2, 206) = 9.60$, $p < .00$, and as is apparent from Fig. 1, most of that increase was due to elevated scores in humanities.

3.4.3 Peer influence

The *peer influence* scores were remarkably stable and high over procrastination levels in medicine, probably due to a strong pressure and culture within that field of study to adhere to common medical and ethical values. Overall, medicine demonstrated a higher level of reported peer influence (3.57 vs. 3.14 in natural sciences and 3.20 in the humanities), $F(2, 212) = 8.63$, $p < .00$, and peer influence increased over procrastination levels, from 2.70 in low procrastinating students to 3.59 in high procrastinators, $F(2, 206) = 24.12$, $p < .00$. Both effects are seen in Fig. 1. As is also evident from that figure, differences in peer influence between the three fields of study largely disappeared at the higher IPS levels.

3.4.4 Exposure

Finally, *exposure* (our estimate of time spent among fellow students) indicated a significant reduction over increasing IPS levels, $F(2, 206) = 9.29$, $p < .00$, from 3.32 at low IPS level to 2.75 at high IPS level. This indicates that the high procrastinator tends to withdraw from interaction with fellow peers rather than spending more time with them. Note that high level of SIAP among students at medicine and natural sciences at high IPS level (Fig. 1) was accompanied by a lower *exposure* scores. Also note that *peer procrastination* remained low in these

groups, indicating that *peer procrastination* bears little relation to heightened SIAP scores for these students.

3.4.5 Relations among variables

Assuming that *peer procrastination*, *peer influence*, IPS, and *exposure* are possible predictors of SIAP, we performed a multiple regression analysis to assess this model. The results indicated that all variables except *exposure* significantly predicted SIAP. The results are displayed in Table 3. The overall model was significant, $F(4, 210) = 27.96$, $p < .00$.

Running this model separately for each field of study indicated that these predictor variables were differentially related to SIAP. Specifically, for the humanities, *peer influence* was the only significant predictor in the regression analysis, for natural science the only significant predictor was IPS (dispositional procrastination), whereas for medicine *peer procrastination*, *peer influence*, and IPS (dispositional procrastination) all predicted SIAP. These results are shown in Table 3. The model was significant for each study field, $F(4, 46) = 8.78$, $p < .00$ (natural sciences), $F(4, 108) = 10.29$, $p < .00$ (medicine), and $F(4, 46) = 8.34$, $p < .00$ (humanities).

Table 3 Multiple linear regression results, socially-induced academic procrastination (SIAP), full sample and subsamples

Predictor variables	*B*	*SE B*	β	*P*	95% CI *B*
		Full sample			
Peer procrastination	.36	.08	.29	.00	.21, .51
Peer influence	.24	.07	.23	.00	.11, .37
Exposure	.09	.06	.10	.13	−.03, .21
Irrational procrastination scale (IPS)	.33	.07	.33	.00	.19, .46
		Medicine			
Peer procrastination	.36	.12	.26	.00	.13, .59
Peer influence	.31	.11	.25	.01	.10, .52
Exposure	.13	.09	.13	.14	−.04, .30
Irrational procrastination scale (IPS)	.24	.09	.25	.01	.06, .42
		Natural sciences			
Peer procrastination	.06	.17	.04	.73	−.28, .40
Peer influence	−.02	.12	−.03	.86	−.26, .22
Exposure	.08	.10	.11	.43	−.12, .28
Irrational procrastination scale (IPS)	.59	.12	.69	.00	.34, .84
		Humanities			
Peer procrastination	.26	.17	.20	.14	−.08, .59
Peer influence	.35	.17	.32	.04	.01, .69
Exposure	.14	.14	.14	.31	−.14, .43
Irrational procrastination scale (IPS)	.29	.16	.26	.08	−.04, .62

4 General discussion

The present study explored the role of environmental factors in academic procrastination. Previous research has found teachers and instructors, as well as task characteristics, to be important exogenous factors in academic delay. We contribute to this knowledge by examining the role of different academic disciplines on procrastination behavior. Study 1 examined three academic disciplines—natural sciences, medicine, and humanities—on six dimensions believed to be important for academic procrastination. Study 2 extended this line of reasoning by examining academic procrastination in samples from these disciplines.

The main results can be summarized as follows: Academic procrastination (SIAP) and peer procrastination (evaluations of other students' procrastination habits) were higher in humanities compared to natural sciences and medicine. Importantly, these differences were modulated by dispositional tendency to procrastinate. Specifically, students low in dispositional procrastination (as defined by low scores on the IPS) appeared to be little affected by differences in study program; they demonstrated little socially-induced academic procrastination and reported peers to procrastinate little. In contrast, students at higher dispositional procrastination levels reported higher degrees of SIAP, but highly dependent on study program. Thus, for students at medium to high levels of dispositional procrastination, humanities indicated significantly higher degree of SIAP compared to students in medicine and natural sciences, in addition to reporting higher degree of peer procrastination. As students at this dispositional level of procrastination constitute the majority of the student population, these results suggest that social and environmental factors potentially are important for a large number of students.

To our knowledge, these findings are the first to demonstrate that students at the same level of dispositional procrastination (medium IPS) are differentially influenced by environmental factors related to academic procrastination behavior. Students at the humanities demonstrated here a higher level of SIAP, as well as evaluating their peers as procrastinating more than students in both medicine and natural sciences. It might be argued that these results may be explained in terms of selection, students at the humanities preferring study directions that permit a higher degree of procrastination. Support for this hypothesis is the fact that the student groups differed in mean dispositional procrastination scores, students from humanities scoring somewhat higher compared to the other two groups. However, note in Fig. 1 that students are compared at similar procrastination levels, and that SIAP levels are very similar among the groups at low and high procrastination levels; the student groups differ in terms of SIAP only at medium level of dispositional procrastination. We interpret this as quite a strong hint that students at medium procrastination level differ either because of procrastinating peers (as indicated by correlated peer procrastination scores in these students) and/or study program differences. In the present study, it is not possible to separate these sources, but it is reasonable to believe that they are intimately interwoven, self-regulation probably being a basic causal mechanism with environmental factors being a facilitator for less self-regulated students. Several of the dimensions evaluated by

our independent sample (Table 1) are known to facilitate procrastination (Steel 2007) and, as shown in the table, humanities were evaluated as scoring significantly higher on these facilitating factors compared to medicine and natural sciences.

It should be noted that procrastination is a term with negative connotations, maybe more so in some contexts compared to others. For example, it is possible that there is a cultural difference between natural science and medicine on the one hand, and humanities on the other, implying that delay is differentially perceived as unwanted and detrimental versus productive and positive. Consequently, this might imply that our measure of SIAP may wrongly classify behavioral episodes among students in the humanities as "procrastination" rather than as "discussion" or "reflection." If correct, this hypothesis would imply a lower correlation between SIAP and dispositional procrastination in the humanities subgroup compared to medicine and natural sciences. However, this correlation was high in the humanities subgroup ($r = .46$), lower in medicine ($r = .37$) and highest in natural sciences ($r = .65$). Also note that SIAP scores among low and high procrastinators were very similar between student groups, further suggesting that these students demonstrate a relatively similar understanding of the SIAP items. Hence, although we recognize the need for cross-cultural validation of procrastination scales (e.g., Mann 2016; Svartdal et al. 2016), we believe that SIAP as reported in the present study in fact reflects unwanted academic delay.

Our results also indicate that determinants of socially-induced academic procrastination may differ between the student groups. Thus, whereas SIAP in the natural sciences subgroup was related to dispositional procrastination (IPS), with little relation to *peer procrastination* or *peer influence*, the picture was more complex in medicine and humanities. In both the latter cases, both *peer procrastination* and *peer influence* explained significant parts of the variance associated with SIAP. This indicates that differences among study regimes affect the way students interact and hence how academic procrastination is best explained. Thus, in the natural sciences subgroup, a dispositional explanation of SIAP seems appropriate, whereas in the medicine and humanities subgroups environmental and situational explanations must complement a dispositional explanation.

As for *peer influence*, no differences between the study programs were observed for students with middle and high levels of dispositional procrastination; at low levels of dispositional procrastination, however, medicine students reported to be significantly more influenced by their peers. This difference is reasonable, given the high demands and grade pressure in medicine studies, as well as strong pressure to adhere to common medical and ethical values. Overall, *peer influence* could have beneficial or detrimental effects, depending on *peer procrastination* level. The present results indicate, however, that both peer influence and peer procrastination are positively related to SIAP, the most negative scenario being a student reporting high peer influence among high procrastinating peers. The correlation between IPS and *peer procrastination* ($r = .36$; see Table 2) may indicate a bias in perception of others, alternatively that students select peers with procrastination habits similar to themselves, thus creating micro-environments that facilitate procrastination. Of note, this correlation differed among the study programs, with strongest correlation ($r = .41$) in the humanities.

Our survey to assess procrastination-relevant dimensions among study programs indicates that the three programs differ in significant ways on important dimensions. At least two of these dimensions, structured course progression and freedom in the study situation, are definitely procrastination-friendly factors, and they differed in this case markedly between the study programs. Importantly, similar differences were observed in respondents who were students at the programs themselves, indicating that students at different study programs have different expectations, beliefs, and attitudes that may represent strong facilitators for academic procrastination. Future research should explore these factors in more detail, along with different avenues of prevention and intervention measures to counteract their detrimental effects. For example, if freedom in the study situation is highly valued in some study programs, what measures can be taken to prevent this factor from creating unwanted academic procrastination?

4.1 Limitations and future studies

First, the present study focused on one form of academic procrastination behavior, i.e. being distracted from planned academic work by peers, and included only a limited sample of environmental factors possibly contributing to such academic procrastination behavior. Future studies should include additional and more diverse measures to enable more precise conclusions about the exact nature of social and environmental features related to academic procrastination. Second, it should be noted that in Norway, like in many other countries, medicine is regarded as high prestige study with high grade requirements to enter. Although previous research has found only small differences in grades and intelligence between high and low procrastinators (Steel 2007), it is likely that medical students represent a group of students who differ from natural sciences and humanities students in their self-regulation abilities. This again speaks for the inclusion of other study programs. Third, the relatively low sample size of the present study indicates that conclusions should be interpreted with some caution. Finally, as pointed out by many authors examining peer effects (e.g., Eisenkopf 2009), it is difficult to examine how students self-select into smaller peer groups within each field of study. Such micro-environments might have an unexpected and opposite effect of what could be expected in an overall environment, speaking for a closer examination of the role of subgroups within larger student groups.

Appendix

Peer procrastination

- There is a culture among my fellow students to delay exams-reading and starting writing assignments/Det er en kultur blant mine medstudenter for å utsette eksamenslesing og oppgaveskriving

- My fellow students rarely delay schoolwork/Mine medstudenter utsetter sjelden skolearbeid
- Many of my fellow students are relaxed about their schoolwork/Mange av mine medstudenter er avslappet til skolearbeid
- There is a culture among my fellow students to get started early and finish early with schoolwork/Det er en kultur blant mine medstudenter for å komme tidlig i gang og bli ferdig med skolearbeid

Peer influence

- When I am late with my schoolwork, I find it reassuring that other students are also behind on their work/Når jeg er sent ute med skolearbeid, opplever jeg det betryggende at andre studenter også henger etter
- When other students around me delay working on their schoolwork, it gets easier for me to delay as well/Når jeg opplever at andre studenter rundt meg utsetter skolearbeid, blir det lettere for meg å utsette
- I work more on my schoolwork when I know my fellow students are working as well/Jeg jobber mer med skolearbeid når jeg vet andre medstudenter også jobber med det
- I envy those students who get started early on their exams-reading and written assignments/Jeg misunner de studenter som kommer tidlig i gang med eksamenslesing eller oppgaveskriving
- I work harder when I know I am behind my fellow students on schoolwork/Jeg jobber mer når jeg vet at jeg ligger etter mine medstudenter
- I try to work as much as my fellow students with schoolwork/Jeg prøver å jobbe omtrent like mye som mine medstudenter med skolearbeid

Exposure

- I spend a lot of time on the university/Jeg tilbringer mye tid på universitetet
- I work a lot with schoolwork together with my fellow students/Jeg jobber mye med skolearbeid sammen med mine medstudenter
- I am often social with my fellow students/Jeg er ofte sosial med mine medstudenter

Socially-induced academic procrastination (SIAP)

- When I am at the university to work, I often get distracted by activities with my fellow students/Når jeg er på universitetet for å jobbe, blir jeg ofte distrahert av aktiviteter med mine medstudenter

- If I have to choose between schoolwork and being together with friends, I usually choose to be with friends/Hvis jeg må velge mellom skolearbeid og være sammen med venner, velger jeg som oftest å være med sammen med venner
- When I am with other students to do schoolwork, we often end up doing other things instead/Når jeg er sammen med andre studenter for å jobbe med skolearbeidet, ender det ofte opp med at vi gjøre andre ting i stedet

References

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

Alexander, E. S., & Onwuegbuzie, A. J. (2007). Academic procrastination and the role of hope as a coping strategy. *Personality and Individual Differences, 42*(7), 1301–1310. doi:10.1016/j.paid.2006.10.008.

Antony, M. M., Purdon, C. L., Huta, V., & Swinson, R. P. (1998). Dimensions of perfectionism across the anxiety disorders. *Behaviour Research and Therapy, 36*(12), 1143–1154. doi:10.1016/S0005-7967(98)00083-7.

Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological Science, 13*(3), 219–224. doi:10.1111/1467-9280.00441.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191. doi:10.1037/0033-2.

Becher, T. (1994). The significance of disciplinary differences. *Studies in Higher Education, 19*(2), 151–161. doi:10.1080/03075079412331382007.

Blunt, A. K., & Pychyl, T. A. (2000). Task aversiveness and procrastination: A multi- dimensional approach to task aversiveness across stages of personal projects. *Personality and Individual Differences, 28*(1), 153–167. doi:10.1016/S0191-8869(99)00091-4.

Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). New York City: The Guilford Press.

Brownlow, S., & Reasinger, R. D. (2000). Putting off until tomorrow what is better done today: Academic procrastination as a function of motivation toward college work. *Journal of Social Behavior and Personality, 15*(5), 15.

Cao, L. (2012). Differences in procrastination and motivation between undergraduate and graduate students. *Journal of the Scholarship of Teaching and Learning, 12*(2), 39–64.

Carrell, S. E., Fullerton, R. L., & West, J. E. (2009). Does your cohort matter? Measuring peer effects in college achievement. *Journal of Labor Economics, 27*(3), 439–464. doi:10.1086/600143.

Coleman, J. S., & Department of Health USA. (1966). *Equality of educational opportunity* (Vol. 2). Washington, DC: US Department of Health, Education, and Welfare, Office of Education.

Corkin, D. M., Yu, S. L., Wolters, C. A., & Wiesner, M. (2014). The role of the college classroom climate on academic procrastination. *Learning and Individual Differences, 32,* 294–303. doi:10.1016/j.lindif.2014.04.001.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives*. doi:10.14507/epaa.v8n1.2000.

Dewitte, S., & Lens, W. (2000). Procrastinators lack a broad action perspective. *European Journal of Personality, 14*(2), 121–140.

Eisenkopf, G. (2009). Peer effects, motivation, and learning. *Economics of Education Review, 29*(3), 364–374. doi:10.1016/j.econedurev.2009.08.005.

Ellis, A., & Knaus, W. (1977). *Overcoming procrastination*. New York: Signet.

Falk, A., & Ichino, A. (2006). Clean evidence on peer effects. *Journal of Labor Economics, 24*(1), 39–57. doi:10.1086/497818.

Fee, R. L., & Tangney, J. P. (2000). Procrastination: A means of avoiding shame or guilt? *Journal of Social Behavior and Personality, 15*(5), 167.

Fernie, B. A., Spada, M. M., Nikčević, A. V., Georgiou, G. A., & Moneta, G. B. (2009). Metacognitive beliefs about procrastination: Development and concurrent validity of a self-report questionnaire. *Journal of Cognitive Psychotherapy, 23*(4), 283–293. doi:10.1891/0889-8391.23.4.283.

Ferrari, J. R., Johnson, J. L., & McCown, W. G. (1995). Procrastination Research. In J. R. Ferrari, J. L. Johnson, & W. G. McCown (Eds.), *Procrastination and task avoidance: Theory, research, and treamtent* (pp. 41–46). New York: Plenum Press.

Ferrari, J. R., & Patel, T. (2004). Social comparisons by procrastinators: Rating peers with similar or dissimilar delay tendencies. *Personality and Individual Differences, 37*(7), 1493–1501. doi:10.1016/j.paid.2004.02.006.

Festinger, L. (1964). *Conflict, decision, and dissonance* (Vol. 3). Stanford: Stanford University Press.

Flett, G. L., Blankstein, K. R., & Martin, T. R. (1995). Procrastination, negative self-evaluation, and stress in depression and anxiety. In J. R. Ferrari, J. L. Johnson, & W. G. McCown (Eds.), *Procrastination and task avoidance: Theory, research, and treatment* (pp. 41–46). New York: Plenum Press.

Foster, G. (2006). It's not your peers, and it's not your friends: Some progress toward understanding the educational peer effect mechanism. *Journal of Public Economics, 90*(8), 1455–1475. doi:10.1016/j.jpubeco.2005.12.001.

Foster, G., & Frijters, P. (2010). Students' beliefs about peer effects. *Economics Letters, 108*(3), 260–263. doi:10.1016/j.econlet.2010.05.020.

Grunschel, C., Patrzek, J., & Fries, S. (2013). Exploring reasons and consequences of academic procrastination: An interview study. *European Journal of Psychology of Education, 28*(3), 841–861. doi:10.1007/s10212-012-0143-4.

Gustavson, D. E., Miyake, A., Hewitt, J. K., & Friedman, N. P. (2014). Genetic relations among procrastination, impulsivity, and goal-management ability implications for the evolutionary origin of procrastination. *Psychological Science, 25*(6), 1178–1188. doi:10.1177/0956797614526260.

Hoxby, C. M., & Weingarth, G. (2005). Taking race out of the equation: School reassignment and the structure of peer effects (No. 7867). Working paper.

Kline, R. B. (2016). *Principles and practice of structural equation modeling*. New York City: Guilford publications.

Klingsieck, K. B., Grund, A., Schmid, S., & Fries, S. (2013). Why students procrastinate: A qualitative approach. *Journal of College Student Development, 54*(4), 397–412. doi:10.1353/csd.2013.0060.

Lamwers, L. L., & Jazwinski, C. H. (1989). A comparison of three strategies to reduce student procrastination in PSI. *Teaching of Psychology, 16*(1), 8–12. doi:10.1207/s15328023top1601_2.

Lee, E. (2005). The relationship of motivation and flow experience to academic procrastination in university students. *The Journal of Genetic Psychology, 166*(1), 5–15. doi:10.3200/GNTP.166.1.5-15.

Lyle, D. S. (2007). Estimating and interpreting peer and role model effects from randomly assigned social groups at West Point. *The Review of Economics and Statistics, 89*(2), 289–299. doi:10.1162/rest.89.2.289.

Mann, L. (2016). Procrastination revisited: A commentary. *Australian Psychologist, 51,* 47–51. doi:10.1111/ap.12208.

Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology, 57,* 401–421. doi:10.1146/annurev.psych.57.102904.190127.

Patrzek, J., Grunschel, C., & Fries, S. (2012). Academic procrastination: The perspective of university counsellors. *International Journal for the Advancement of Counselling, 34*(3), 185–201. doi:10.1007/s10447-012-9150-z.

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*(5), 239.

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*(5), 135.

Rozental, A., & Carlbring, P. (2014). Understanding and treating procrastination: A review of a common self-regulatory failure. *Psychology, 5*(13), 1488. doi:10.4236/psych.2014.513160.

Sacerdote, B. (2011). Peer effects in education: How might they work, how big are they and how much do we know thus far? *Handbook of the Economics of Education, 3,* 249–277. doi:10.1016/b978-0-444-53429-3.00004-1.

Schachter, S., Christenfeld, N., Ravina, B., & Bilous, F. (1991). Speech disfluency and the structure of knowledge. *Journal of Personality and Social Psychology, 60*(3), 362. doi:10.1037/0022-3514.60.3.362.

Scher, S. J., & Ferrari, J. R. (2000). The recall of completed and noncompleted tasks through daily logs to measure procrastination. *Journal of Social Behavior and Personality, 15*(5), 255.
Schraw, G., Wadkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. *Journal of Educational Psychology, 99*(1), 12. doi:10.1037/0022-0663.99.1.12.
Senécal, C., Lavoie, K., & Koestner, R. (1997). Trait and situational factors in procrastination: An interactional model. *Journal of Social Behavior and Personality, 12*(4), 889.
Sirois, F. M. (2014). Procrastination and stress: Exploring the role of self-compassion. *Self and Identity, 13*(2), 128–145. doi:10.1080/15298868.2013.763404.
Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: Frequency and cognitive-behavioral correlates. *Journal of Counseling Psychology, 31*(4), 503–509. doi:10.1037/0022-0167.31.4.503.
Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133*(1), 65. doi:10.1037/0033-2909.133.1.65.
Steel, P. (2010). Arousal, avoidant, and decisional procrastinators: Do they exist? *Personality and Individual Differences, 48*(8), 926–934. doi:10.1016/j.paid.2010.02.025.
Stinebrickner, R., & Stinebrickner, T. R. (2006). What can be learned about peer effects using college roommates? Evidence from new survey data and students from disadvantaged backgrounds. *Journal of Public Economics, 90*(8), 1435–1454. doi:10.1016/j.jpubeco.2006.03.002.
Stöber, J., & Joormann, J. (2001). Worry, procrastination, and perfectionism: Differentiating amount of worry, pathological worry, anxiety, and depression. *Cognitive Therapy and Research, 25*(1), 49–60. doi:10.1023/A:1026474715384.
Streiner, D. L. (2003). Starting at the beginning: An introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment, 80*(1), 99–103. doi:10.1207/s15327752jpa8001_18.
Svartdal, F. (2015). Measuring procrastination: Psychometric properties of the Norwegian versions of the irrational procrastination scale (IPS) and the pure procrastination scale (PPS). *Scandinavian Journal of Educational Research*. doi:10.1080/00313831.2015.1066439.
Svartdal, F., Pfuhl, G., Nordby, K., Foschi, G., Klingsieck, K. B., Rozental, A., et al. (2016). On the measurement of procrastination: Comparing two scales in six European countries. *Frontiers in Psychology, 7,* 1307. doi:10.3389/fpsyg.2016.01307.
Tuckman, B., & 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. doi:10.1037/10808-007.
van Eerde, W. (2000). Procrastination: Self regulation in initiating aversive goals. *Applied Psychology, 49*(3), 372–389. doi:10.1111/1464-0597.00021.
Wesp, R. (1986). Reducing procrastination through required course involvement. *Teaching of Psychology, 13*(3), 128–130. doi:10.1207/s15328023top1303_6.
Zajonc, R. B., & Sales, S. M. (1966). Social facilitation of dominant and subordinate responses. *Journal of Experimental Social Psychology, 2*(2), 160–168. doi:10.1016/0022-1031(66)90077-1.
Ziesat, H. A., Rosenthal, T. L., & White, G. M. (1978). Behavioral self-control in treating procrastination of studying. *Psychological Reports, 42*(1), 59–69. doi:10.2466/pr0.1978.42.1.59.
Zimmerman, D. J. (2003). Peer effects in academic outcomes: Evidence from a natural experiment. *Review of Economics and Statistics, 85*(1), 9–23. doi:10.1162/003465303762687677.

Kent Nordby licensed psychologist, PhD student, Department of Psychology, UiT the Arctic University of Norway. Interests: Procrastination, self-regulation.

Katrin B. Klingsieck PhD, professor, Department of Psychology, Paderborn University, Germany. Interests: self-regulation and self-regulated learning (e.g., procrastination, academic writing competence), professional competence of teachers and teacher education, didactics in higher education.

Frode Svartdal PhD, professor, Department of Psychology, UiT the Arctic University of Norway. Interests: Cognition, learning, verbal control, self-regulation, procrastination, social competence training, psychometrics, research methods.