

Do procrastination-friendly environments make students delay unnecessarily?

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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

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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	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
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

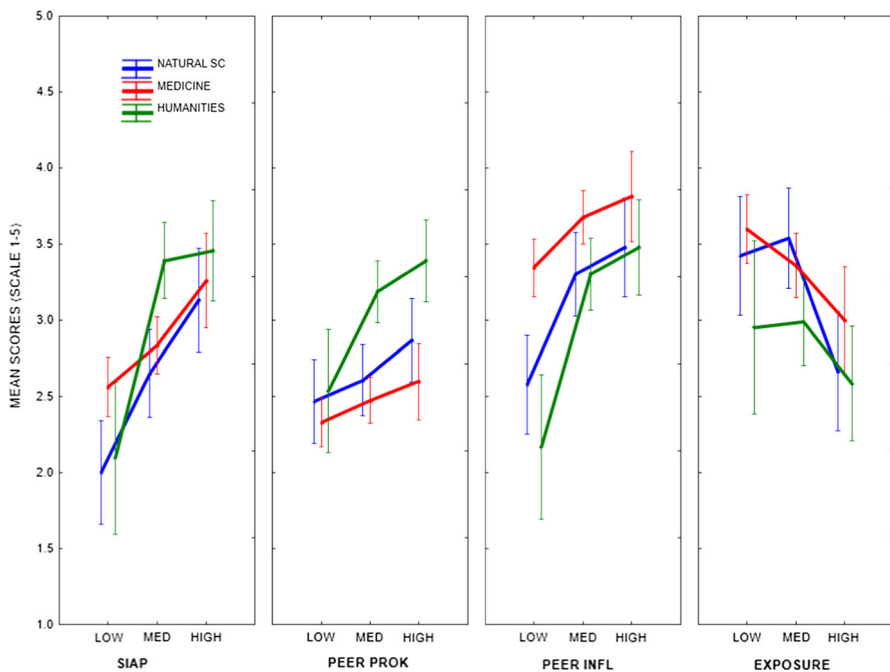
3.4.1 Socially-induced procrastination (SIAP)

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	<i>M</i>	<i>SD</i>	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	<i>B</i>	<i>SE B</i>	β	<i>P</i>	95% CI <i>B</i>
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 distraheret 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

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