Stop Procrastinating: Effects of a CBT-based Group Intervention on Procrastination and Mental Wellbeing in Students

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Abstract

Students in particular suffer from procrastination. This can lead to serious academic and health problems. This study therefore aims to investigate the treatment effects of a short cognitive behavioural therapy (CBT)-based group intervention on procrastination and mental wellbeing in university students (n = 40). It was carried out as a randomized controlled trial with a waitlist control group. Procrastination and mental wellbeing were assessed before and after the intervention group received the intervention. It was based on previous research and consisted of four weekly training sessions featuring CBT-techniques. Results showed that the intervention helped participants reduce their procrastination significantly, with a large effect size. Mental wellbeing improved in the whole sample, with a large effect size, but it did not improve to a larger extent in the intervention group than in the control group. This study provides promising new insights into the effectiveness of a short CBT-based group intervention to address procrastination in students. Further research with an active control group, to eliminate non-specific intervention factors, is needed to validate the results. Consequently, this intervention might be an effective and time-efficient treatment option that can be offered in university settings in the future.

Keywords: procrastination, cognitive behavioural therapy, randomized controlled trial, mental wellbeing

Procrastination is a prevalent phenomenon in university students (Rozental et al., 2018a). It entails that someone "voluntarily delays an intended course of action despite expecting to be worse off for the delay" (Steel, 2007, p. 66). Typical examples of procrastination are watching television instead of doing homework, or surfing the internet instead of filling in a tax declaration. Considering that procrastination is a widespread problem and numbers are increasing (Kachgal, Hansen, & Nutter, 2001), researchers see a need to understand the concept more fully. Steel (2007), for example, undertook a meta-analysis to investigate numerous variables that might play a role in the occurrence of procrastination. He found that four factors are most strongly and robustly linked to procrastination. These factors are integrated into the *temporal motivation theory* (TMT). According to TMT, the utility (desirability) of a task depends on the expectation of individual success, the perceived value of a task, the impulsivity of the actor and the time the task costs to be rewarded, which all interact with each other. This concept is also called the *procrastination equation* (Steel, 2007), which states that the lower the utility of a task, the higher the possibility that someone procrastinates. The likelihood of procrastination increases

when the expectation of success or the value of the task decrease while the impulsivity of the actor or the time it takes to complete the task increase.

The following example illustrates how those factors work together. Jan is a student who wants to finish his bachelor's degree in July. To do so, he has to write his bachelor thesis during the next months. On the other hand, Jan wants to enjoy the last months with his friends, who will also graduate soon. Jan expects to be able to write his thesis if he puts enough time and effort into his work. However, the value of doing this is lower than meeting up with his friends today because the reward of writing the thesis is less pleasurable and temporally more distant. Competing or more tempting choices like going out with friends easily distract Jan. This component of impulsivity increases his likelihood to procrastinate. As time passes, the deadline looms and Jan realizes that he needs to start writing immediately to be able to finish his thesis. This realization increases his motivation and the utility of writing the thesis. Thus, he starts the task and stops procrastinating.

Between 80% and 95% of university students experience similar difficulties with procrastination and almost half of them experience it as a problem they suffer from (Day, Mensink, & O'Sullivan, 2000; Steel, 2007). Procrastination is often associated with negative consequences for the individual. These consequences impact students' academic performance and can lead to higher rates of course withdrawal and lower grades (Balkis, 2013; Steel, 2007). Further, procrastination can result in physical (Bogg & Roberts, 2004; Sirois & Melia-Gordon, 2003) and mental health (Stead, Shanahan, & Neufeld, 2010) problems including more health-risky choices, less help-seeking behaviour, higher prevalence of mental disorders and stress. Ultimately, procrastination leads to lower satisfaction with life (Beutel et al., 2016) in general. Therefore, focusing research on approaches to alleviating procrastination is particularly important.

Even though many studies have been concerned with theoretical explanations for procrastination (Steel, 2007), only a few studies have used this knowledge to examine possible effects of interventions to treat procrastination. Rozental et al. (2018a) reviewed hundreds of studies of which only 12 could be included in the further analysis as they employed *randomized controlled trials* (RCTs) that focus on psychological interventions for procrastination. Only RCTs were included because the effectiveness of a specific treatment can be assessed using this design. RCTs control for changes in the outcome measure due to non-intervention related factors such as spontaneous improvement over time, by including a control group that does not undergo the intervention. Only in this way can researchers conclude that the outcomes of an intervention are caused by the treatment rather than by other

factors. Rozental et al. (2018a) also found that most psychological treatments had small effects on procrastination, but the interventions showed considerable between-study variation. Interestingly, of all treatments, *cognitive behavioural therapy* (CBT)-based interventions showed the most robust and marked results, meaning that they had no heterogeneity in treatment results and moderate, significant between-group effect sizes. This is interesting because CBT-based interventions target the factors of the above-mentioned procrastination equation by Steel (2007). By following this approach, they are one of the few interventions that use knowledge about theoretical explanations for procrastination as a basis for treatment. Nevertheless, only a few RCTs investigate the impact of CBT-based treatments on procrastination (Rozental et al., 2018a). Thus, Rozental et al.'s (2018a) findings support Steel's (2007) theory and they point to the need for further application of RCT approaches to effectively treat procrastination using CBT-based interventions.

Rozental et al. (2018b) deepened their research by using an RCT to investigate the effectiveness of an eight-week CBT on procrastination in students. The CBT was either delivered online or as a face-to-face training group. Both methodologies revealed a significant reduction in procrastination after the intervention period. However, only the group undergoing the face-to-face intervention based on Rozental and Wennersten's self-help book (2014) maintained or extended their improvements after six months. Even though these results are promising, the study also revealed limitations. First, every fifth participant dropped out of the treatment (Rozental et al., 2018b). This makes it difficult to generalize the study's results. Research by Cooper and Conklin (2015) has shown that high dropout rates are associated with longer treatment duration. Thus, shorter interventions are recommended for decreasing dropout rates. Further, Rozental et al.'s (2018b) intervention was carried out in Swedish. For a more international application, an English version of the procrastination intervention would reach more potential participants.

In conclusion, only a few RCTs currently exist that investigate the effectiveness of a CBT-based treatment for procrastination in students. Those RCTs are the only valid studies from which conclusions can be derived about possible treatment effects, as they randomized participants into at least one experimental condition and a control condition to control for non-intervention factors contributing to the improvement. Furthermore, the most recent study of these RCTs (Rozental et al., 2018b) has uncovered high dropout rates, making it difficult to generalize the results, and was not applicable internationally due to language considerations. Further research is therefore imperative for expanding our knowledge of effective procrastination interventions.

Thus, the first aim of the current study was to investigate whether a shortened English version of the CBT-based group intervention based on Rozental et al. (2018b) would show significant effects on procrastination in a convenience sample of university students when carried out as an RCT with a waitlist control group. Building on previous research, it was expected that the group training would result in a larger reduction of procrastination in the intervention group compared to the control group (Rozental et al., 2018a; Rozental et al., 2018b). It was also expected that the dropout rate (Rozental et al., 2018b) would be lower in this shortened version of the intervention (Cooper & Conklin, 2015). The current study attempts to broaden scientific knowledge on the effectiveness of CBT-based procrastination interventions in university students. This could be important in suggesting ways to enlarge treatment options and expand current knowledge on how to improve students' lives.

Aside from procrastination, mental health also figures large in students' experience. (Macaskill, 2013). Mental health consists of two components: mental illness and mental wellbeing, situated on opposing poles of a continuum. Mental illness, on the one hand, refers to psychological problems that can result in mental disorders (Goldman & Grob, 2006). The concept of mental wellbeing, on the other hand, is defined as "a state in which the individual realizes his or her own abilities, copes with the normal stresses in life, works productively and makes a contribution to his or her community" (WHO, 2004; p. 4). In the last years, psychological problems have been increasing in frequency and severity among university students (Kitzrow, 2003). This results in many students suffering from stress, lower reported levels of satisfaction and quality of life, sleeping problems, depression and anxiety (Hunt & Eisenberg, 2010; Kadison & DiGeronimo, 2004). The occurrence and high prevalence of those issues make it vital to create possibilities for improving students' mental health by increasing their mental wellbeing and thereby lowering the risks of them suffering from mental illness.

Research has shown that CBT interventions can help improve mental wellbeing (Enns et al., 2015; Murray, Murray, & Donnelly, 2016; Räsänen, Lappalainen, Muotka, Tolvanen, & Lappalainen, 2016; Weiss, Westerhof, & Bohlmeijer, 2016). These interventions typically involve components like goal-setting techniques (Locke & Latham, 2002), training in coping skills and mental relaxation (Murray et al., 2016), psychoeducation (Dale, Brassington, & King, 2014), managing their own cognitions and relapse prevention (Räsänen et al., 2016). Except for mental relaxation training, all these tools are part of the intervention used in the current study to decrease procrastination. Therefore, the training components of the procrastination intervention may indirectly also affect students' wellbeing.

Thus, the second research question was whether a CBT-based group intervention would indirectly influence a participant's mental wellbeing, as a secondary outcome. Due to the extensive overlap in the intervention components, it was hypothesized that students in the intervention condition would improve significantly more in mental wellbeing from pre- to post-assessment than those in the control condition. The results help broaden the knowledge of secondary effects of the procrastination training. Furthermore, if mental wellbeing does increase through the intervention, this could lead to an improved quality of life and a reduced risk of health problems (Weiss et al., 2016) in the participants.

Method

Participants

The sample of the current RCT consisted of 36 students (nine men, 27 women, *M*age = 21.25, *SD* = 1.70) from Radboud University in Nijmegen. 40 participants filled in the pre-assessment and four of them were excluded from the analysis as they did not attend the training sessions or fill in the post-assessment. Nearly all participants were psychology students and the majority (*n* = 31) were in their first year of university. The participants were recruited through the SONA research system or by way of social media and printed handouts at the university. Inclusion criteria were that the participants needed to be between 18 and 30 years old and to be fluent English speakers. Participation in this study was voluntary and as reimbursement for taking part, the participants received research participation points. All participants were randomly assigned to the intervention condition or the waitlist control condition (see Table 1). They were then split up into two groups per condition. These groups consisted of nine participants each as it was found that the optimal group size for training is around ten participants per group (Rozental et al., 2018b).

Table 1

Sociodemographic characteristics

	Intervention group (*n* =18)		Control group (*n* =18)		Total sample (*N* = 36)	
Age: *M* (*SD*)	20.78	(1.48)	21.72	(1.81)	21.25	(1.70)
Gender: *N* (%)						
Male	3	(16.7)	6	(33.3)	9	(25.0)
Female	15	(83.3)	12	(66.7)	27	(75.0)
Study year: *N* (%)						
First year	16	(88.9)	15	(83.3)	31	(86.1)
Bachelor 1+	2	(11.1)	2	(11.1)	4	(11.1)

Master	0	(0)	1	(5.6)	1	(2.8)
Study topic: *N* (%)						
Psychology	18	(100.0)	17	(94.4)	35	(97.2)
Behavioural Science	0	(0)	1	(5.6)	1	(2.8)

Material

Outcome measures

Procrastination was measured before and after the intervention to assess the effectiveness of the treatment with the English version of the Pure Procrastination Scale (PPS; Steel, 2010). The questionnaire contains 12 items (e.g. "I delay making decisions until it's too late") that are rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The lower the total score (ranging from 12 to 60), the less severe the participant's procrastination. The psychometrical qualities of the PPS are good. The English version of the PPS has high internal consistency, Cronbach's $\alpha = 0.92$, and a good convergent validity with related measures (Rozental et al., 2014; Svartdal et al., 2016). As an additional measure, the participants were asked to rate their subjectively experienced burden due to procrastination on a scale ranging from 0 to 10, before and after the intervention. This was done to check if participants experienced their level of procrastination as a burden and whether this would change after the intervention.

Mental wellbeing was assessed before and after the intervention with the Warwick Edinburgh Mental Well-being Scale (WEMWBS; Tennant et al., 2007). This self-report questionnaire consists of 14 items that are rated on a 5-point Likert Scale ranging from 1 (*none of the time*) to 5 (*all of the time*). A high total score (ranging from 14 to 70) indicates that the participant's mental wellbeing is good. The WEMWBS consists of statements concerning feelings and thoughts the participant possibly experienced over the previous two weeks (e.g. "I've been dealing with problems well"). The psychometrical qualities of the questionnaire are good (Taggart et al., 2013) and the internal consistency of the English version is high, Cronbach's $\alpha = 0.92$ (Stewart-Brown et al., 2011). As a final step, dropout rates and treatment attendance were measured by investigating the numbers of sessions (0 to 4) attended per person.

Procrastination intervention

The intervention is an English short version of a cognitive behavioural therapy approach based on the self-help book by Rozental and Wennersten (2014). In the current

study, the participants were divided into four groups, two for the intervention condition and two for the waitlist control condition. The original intervention was translated into English and shortened to reduce dropout rates. Rozental et al.'s (2018b) intervention consisted of four meetings in eight weeks, lasting three hours each. This was changed into four weekly sessions lasting two hours each. Every group was led by one Master student and one research assistant from Radboud University.

Intervention condition

The two intervention groups received the same training. Each training session was based on the procrastination equation by Steel (2007). They consisted of a PowerPoint presentation, interactive exercises and homework assignments that were based on material from Rozental et al. (2018b). Each session began with evaluating the homework assignments from the previous week. The current week's main topics were then introduced and practised with interactive exercises. In the end, new homework assignments were given. Table 2 summarizes the different training components and homework assignments. The intervention's goal was to decrease students' procrastination by training in cognitive and behavioural techniques. An example of such techniques was setting goals. At first, the participants learned that their goals should be meaningful, realistic, positive, challenging and concrete. They were then trained to formulate their personal goals in a specific, measurable, achievable, relevant and time-bound (SMART) manner. Finally, they broke down their goal into smaller parts to make it easier to start with the first step. As a homework assignment, participants formulated a SMART goal related to their procrastination.

Table 2

Training components and homework assignments

Session	**Component**	**Homework assignments**
1.	Introduction, Psychoeducation, Cost/benefit analysis	Your procrastination equation, Cost/benefit analysis
2.	Goal-setting, Motivation, Behaviour activation	SMART goal Fusing
3.	Ego depletion and mental fatigue, Time management, Recovery, Stimulus control,	Pseudo-work Behavioural experiment

	Self-efficacy and self-assertiveness	
4.	Managing maladaptive thoughts, Value clarification, Relapse prevention	Chart your risk factors

Control condition

Simultaneously to the intervention groups, the waitlist control groups filled in the pre-assessment. In the following period of four weeks, in which the intervention groups received the procrastination training, the control groups did no active tasks related to the intervention. Participants could ask questions to the researchers via email. Otherwise, they waited and filled in the post-assessment after four weeks. For ethical reasons, the control groups were also offered the intervention after the original testing period of four weeks (see Figure 1). The findings of this delayed intervention are not included in the current study.

Procedure

The procedure of the current research is illustrated in Figure 1. First, participants were recruited through the Universities Research system SONA, social media, and printed handouts. In this way, prospective participants were informed about the study's content, procedure and purpose. If interested, they made contact with the researchers via email. Then, they received a link to an online platform called Qualtrics, where all questionnaires for the pre-assessment had been placed beforehand. The participants filled in the pre-screening including demographic data and the above-mentioned self-report questionnaires. Consequently, they were randomly assigned to the intervention condition or the waitlist control condition. Afterwards, the participants received a second link via email to sign up on SONA for the timeslots they were allocated to. The training sessions for the intervention condition were planned to take place every Tuesday from 6:30 to 8:30 p.m. in a room at Radboud University. Due to Covid-19*,* the university had a shutdown after the first intervention session and the study's format had to be adapted. The type of training was changed into online group sessions, so that the procrastination intervention could continue. The second, third and fourth meetings were held online via a group meeting on Skype. After the intervention had taken place, all participants filled in the post-assessment on Qualtrics, which contained the same self-report questionnaires as the pre-assessment. Due to Covid-19, the intervention groups had a one-week delay, so they filled in the post-assessment five weeks after the pre-assessment, in comparison to the control groups who filled it in four weeks after the pre-assessment. The timing was important, because afterwards the control groups were

also given the possibility to attend the training, for reasons of fairness. Lastly, reimbursement by way of SONA points was provided.

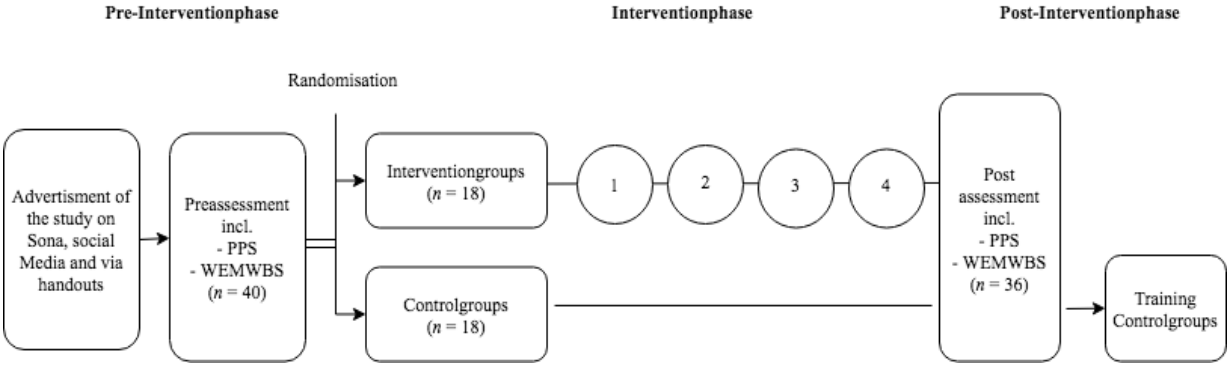

Figure 1: Flowchart of the research procedure

Data analysis

The data were assembled via Qualtrics and then transferred into SPSS. Afterwards, they were prepared for the analysis. The data preparation included a chi square test and one-way analyses of variance (ANOVA) to check for possible group differences at baseline for the variables age, gender, study year, study topic, subjective procrastination, pure procrastination and mental wellbeing. Furthermore, to check for normal distribution and outliers, histograms and boxplots were conducted. Next, descriptive statistics were calculated including means and standard variations. Additionally, correlations between the study's variables were investigated. Consequently, the main analyses could then be carried out. The effectiveness of the procrastination intervention was analysed with a repeated-measures ANOVA with time (pre/post measurement) as the within-subject factor, group (intervention/waitlist control) as the between-subject factor, and pure procrastination (PPS score) as the dependent variable, to answer the first research question. Then, another repeated-measures ANOVA was carried out to investigate the second research question concerning a possible effect of the intervention on the secondary outcome measure mental wellbeing, with time (pre/post measurement) as the within-subject factor, group (intervention/waitlist control) as the between-subject factor and mental wellbeing (WEMWBS score) as the dependent variable. Furthermore, additional analyses were carried out, including a third repeated-measures ANOVA to check whether the intervention would also influence participants' subjectively experienced burden due to procrastination. Lastly, dropout and attendance rates were calculated.

Results

Data preparation

No significant differences were found between the intervention and control group on the variables age $F(1, 34) = 0.62$, $p = .735$, gender $\chi^2(1) = 1.33$, p = .248, study year $F(1, 34) = 0.49$, $p = .619$, study topic $F(1, 34) = 2.14$, $p = .134$, subjectively experienced burden due to procrastination (SP) $F(1, 34) = 0.49$, $p = .747$, pure procrastination (PPS) $F(1, 34) = 1.31$, $p = .280$ and mental wellbeing (WEMWBS) $F(1, 34) = 0.73$, $p = .750$ at baseline. Next, all necessary assumptions for a repeated-measures ANOVA were checked and met by the data. As a consequence, the following analyses could be carried out.

Descriptive statistics

Firstly, means and standard deviations of all outcome variables before and after the training were measured (see Table 3).

Table 3

Means and Standard Deviations observed before and after the training

Outcome measures	Before training (Overall: $N = 36$ Per group: $n = 18$)		After training (Overall: $N = 36$ Per group: $n = 18$)	
	M	*SD*	*M*	*SD*
Main measures				
PPS				
Overall	42.22	6.21	38.11	7.87
Intervention group	41.61	6.50	33.83	7.31
Control group	42.83	6.02	42.39	5.94
WEMWBS				
Overall	40.98	6.67	44.46	7.84
Intervention group	41.33	7.89	45.44	8.82
Control group	40.63	5.39	43.49	6.84
Other measures				
Attendance			3.78	0.55
Age	21.25	1.70		
Subjectively experienced burden due to procrastination (0-10)	6.97	1.34	5.83	2.00

Correlations

There were significant correlations between the PPS scores before and after the training with the SP scores before and after the training (see Table 4). Furthermore, there was a significant negative correlation between the WEMWBS scores before the training with the SP scores before the training. Thus, more subjectively experienced burden due to procrastination was associated with lower wellbeing at baseline.

Table 4

Pearson correlations between outcome measures

	PPS - Pre	PPS - Post	WEMWBS - Pre	WEMWBS - Post	SP - Pre	SP - Post
PPS - Pre	1					
PPS - Post	.649**	1				
WEMWBS - Pre	-.324	-.153	1			
WEMWBS - Post	-.175	-.221	.681**	1		
SP - Pre	.660**	.617**	-.349*	-.281	1	
SP - Post	.481**	.819**	-.130	-.207	.575**	1

*$p < .05$ **$p < .01$ (two-tailed)

Main analyses

First research question

The first repeated-measures ANOVA showed a significant effect of time on pure procrastination $F(1, 34) = 25.49$, $p < .001$, with a large effect size of $\eta^2 = .43$ and a power of 1.0. This means that, over the groups, participants reported significantly higher procrastination scores before the training ($M = 42.22$) than after it ($M = 38.11$). Furthermore, there was a significant effect of group on pure procrastination $F(1, 34) = 6.00$, $p = .020$. The effect size was $\eta^2 = .15$ and the power was .66. Thus, the intervention group reported significantly less procrastination than the control group. Finally and most importantly, there

was a significant interaction effect between time and group on pure procrastination $F(1,34) = 20.27$, $p < .001$, with a large effect size of $\eta^2 = .37$ and a power of .99. This shows that the intervention group had a significantly larger decrease in pure procrastination from pre- to post-intervention than the control group. The intervention condition saw a mean improvement of 0.7 on each item of the PPS scale (ranging from 1 to 5). Thus, there is an average improvement of around 14% per person. In the control condition, there was a mean improvement of around 0.1 on each item of the PPS scale, showing an average improvement of around 2% per person. In the intervention condition, 15 participants improved (83.3%), one did not change from pre- to post-assessment (5.6%) and two participants deteriorated (11.1%). In the control condition, ten participants (55.5%) slightly improved from pre- to post assessment, one did not change (5.6%) and seven scored worse (38.9%).

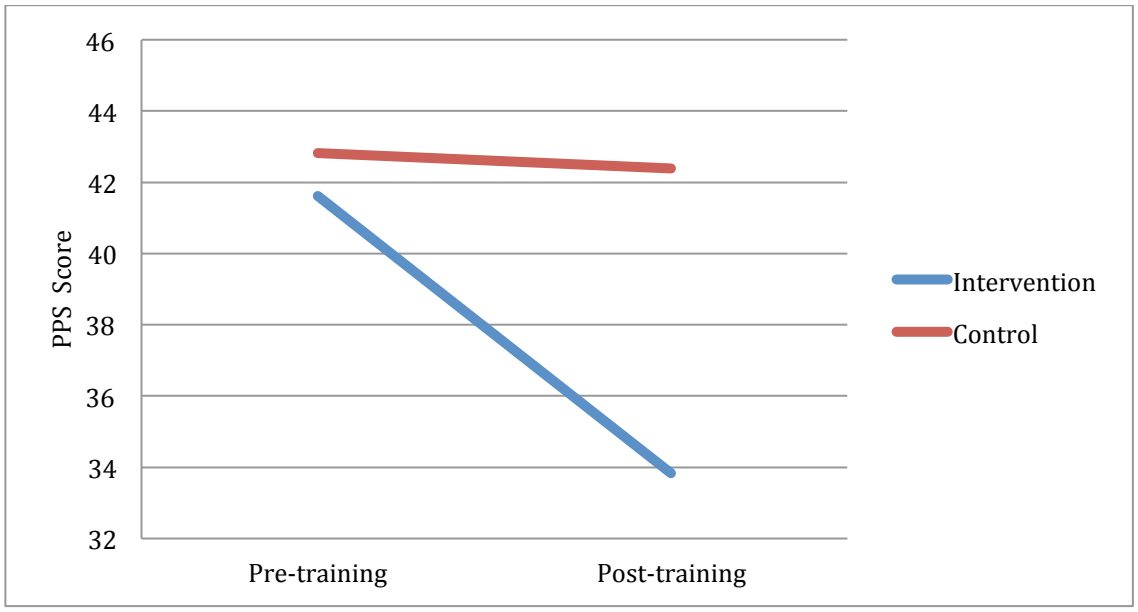

Figure 2: Visualization of the treatment effect of the procrastination intervention on pure procrastination (PPS).

Second research question

To address the second research question, whether the intervention would indirectly improve a participant's mental wellbeing, a second repeated-measures ANOVA was carried out (See Figure 3). There was a significant effect of time on mental wellbeing $F(1, 34) = 12.36$, $p = .001$ with a large effect size of $\eta^2 = .27$ and a power of .87. This means that on average the participants' mental wellbeing improved from pre- to post-assessment, regardless of which condition they were under. Furthermore, there was no significant effect of group on mental wellbeing $F(1, 34) = 0.35$, $p = .556$. This means that there was no significant

difference in mental wellbeing between the intervention and control condition. Finally, there was no significant interaction effect of time and group on mental wellbeing $F(1, 34) = 0.40$, $p = .532$, so that there was no significant difference in the improvement of mental wellbeing from pre- to post-assessment between the intervention and the control condition.

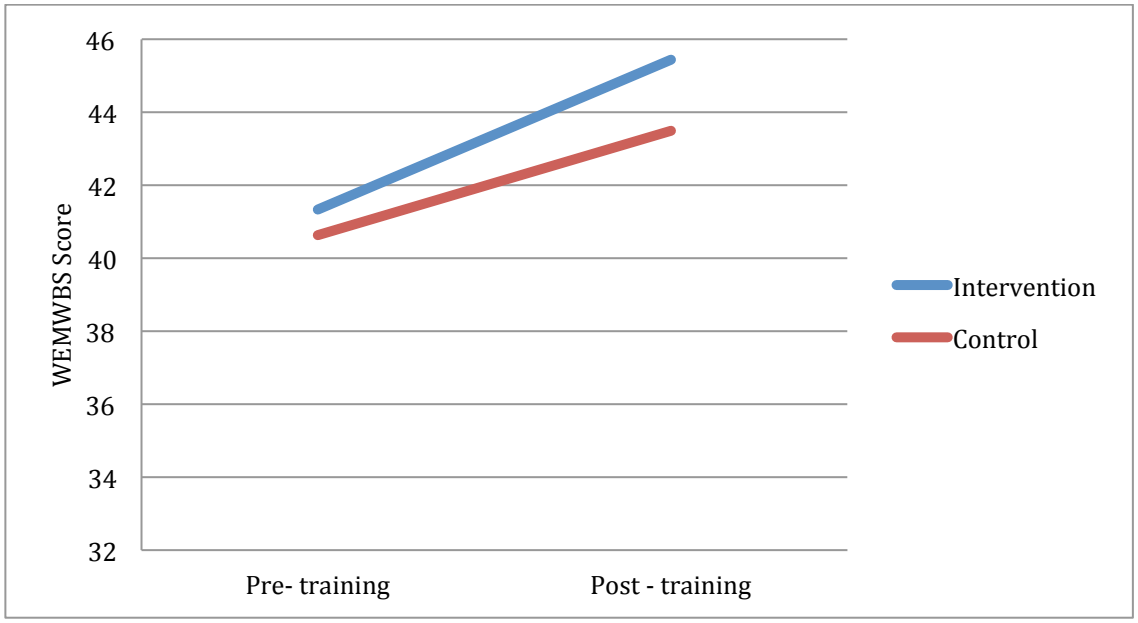

Figure 3: Visualization of the treatment effect of the procrastination intervention on mental wellbeing (WEMWBS).

Additional analyses

Change in subjectively experienced burden due to procrastination

To measure whether the participants' subjectively experienced burden due to procrastination (SP) was also influenced through the intervention, a third repeated-measures ANOVA was carried out. This showed a significant effect of time $F(1, 34) = 33.35$, $p < .001$ with a large effect size of $\eta^2 = .50$ and a power of 1.0. This means that, on average, all participants improved significantly from pre- to post assessment on SP. Additionally, there was a significant effect of group $F(1, 34) = 10.35$, $p = .003$ with a large effect size of $\eta^2 = .23$ and a power of .88, resulting in the intervention group having significantly lower scores on SP than the control group. Finally, there was a significant interaction effect $F(1, 34) = 33.35$, $p < .001$ with a large effect size of $\eta^2 = .50$ and a power of 1.0, indicating that the intervention group improved significantly more from pre- to post-assessment on the SP measure than the control group (see Figure 4).

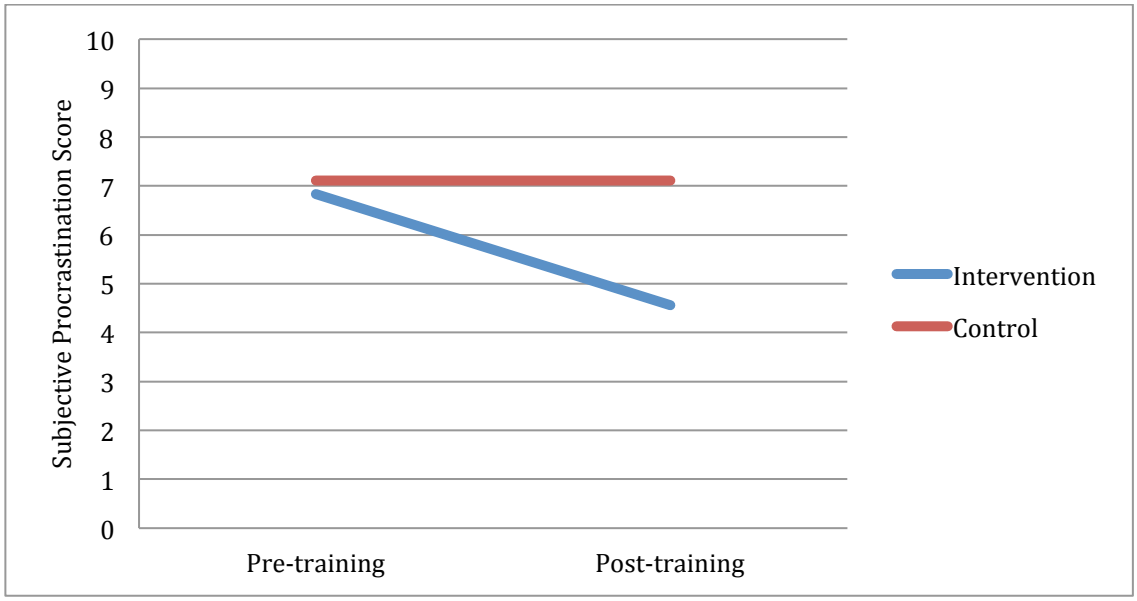

Figure 4: Visualization of the treatment effect of the procrastination training on subjectively experienced burden due to procrastination (SP).

Dropout rate

In this study, four out of 40 participants dropped out during the study, making a dropout rate of 10%.

Attendance

Each participant in the intervention condition of this study attended on average 3.78 out of 4 sessions of the procrastination training. This is an average attendance of 94.5% per person.

Discussion

This study is one of the few randomized controlled trials investigating the effectiveness of a short CBT-based procrastination intervention in university students. The first research aim was to evaluate the effects of a shortened, English version of a group intervention, initially set up by Rozental et al. (2018b). The hypothesis was that the intervention group would improve significantly more from pre- to post-assessment in comparison to a waitlist control group. Moreover, it was expected that the shortened version would result in a lower dropout rate, compared to Rozental et al. (2018b). The results are in line with these expectations. The procrastination level decreased significantly more from pre- to post-measurement in the intervention condition than in the control condition, with large effect sizes. These findings build on existing research by Rozental et al. (2018b), who found

that CBT interventions are a valuable treatment tool for decreasing procrastination in students.

A methodological explanation for the comparable findings could be that the current study used a revised version of Rozental et al.'s (2018b) intervention. It featured the same CBT-oriented techniques and was based on the self-help book by Rozental and Wennersten (2014), although the sessions were shorter. Thus, this study used techniques that had already been found to be effective. Nevertheless, the current study provides new insights into a shorter version of the above-mentioned intervention. In line with expectations, dropout rates in this study were lower. Compared to Rozental et al.'s (2018b) 19.6% of dropout, only 10% dropped out of the current study, thus halving the dropout rate. These beneficial results might be due to the shorter intervention period (Cooper & Conklin, 2015).

Moreover, this study extends on the findings of Rozental et al. (2018b) in the number of participants who improved on the PPS after the intervention. In their study, 33.7% of the participants showed less procrastination after the intervention. In the current study, 83.3% of the participants showed less procrastination after the intervention compared to before. This implies that on a personal level more participants potentially benefit from the revised version of the intervention. This may relate to the fact that the attendance rate in the current study was high. Compared to Rozental et al. (2018b), who had an attendance rate of 67% and an average attendance of 2.68 out of four sessions, the current study had an attendance rate of 94.5%. Thus, there was an increase in attendance of 27.5%. The shorter intervention period might also explain this phenomenon. However, it must be taken into account here that after one week, due to Covid-19, the current study had to be changed from a face-to-face CBT into an online CBT with Skype sessions. Therefore, it is also possible that the high attendance rate resulted from the more accessible study design.

Next, the current study provided novel insights into blended care, due to changes in the study design resulting from Covid-19. The benefits of combining face-to-face CBT with internet-based CBT were already demonstrated in 2013 by Månsson, Skagius Ruiz, Gervind, Dahlin, & Andersson. They investigated whether a blended treatment format would result in a reduction in depression and anxiety symptoms. They found significant improvements with large effect sizes. These findings indicate that the blended treatment format used in this study might also be a possible explanation for the large treatment effects that were found. Lastly, the current study generated new insights with the addition of a measure to investigate the students' subjectively experienced burden due to procrastination (SP). As expected, most participants experienced their procrastination as moderately encumbering at baseline. The

scores of the intervention group decreased significantly more than those of the control group, with an average decrease of 33%. Thus, the intervention also influenced how the participants felt about their procrastination by alleviating their suffering to some extent.

A theoretical explanation for the current findings could be that the intervention used was based on the procrastination equation by Steel (2007). This theory entails that four interacting factors, the expectation of individual success, the value of the task, the impulsivity of the actor and the time an activity takes to be rewarded, determine the desirability of a task. These factors lay the foundation for the decision to perform a task immediately or to procrastinate on it. The intervention used in the current study applied cognitive and behavioural techniques that were in line with the procrastination equation. These techniques involve training self-assertiveness and self-efficacy to increase the subjective expectation of success. Further, they involve managing maladaptive thoughts, value clarification and motivational techniques to increase the value of the task. Moreover, these techniques involve goal setting, psychoeducation, avoiding distractions and ego depletion as strategies for learning to manage impulsivity. Lastly, they involve chunking and rewarding your effort to decrease the time taken to complete a task. Thus, the procrastination equation was part of every session of the currently used intervention. Consequently, the results might have occurred due to the theoretically based CBT techniques that were used.

In conclusion, the findings of the current study build on existing research concerning theoretical explanations (Steel, 2007) and successful treatment options for procrastination (Rozental et al., 2018b). This study provides new insights into a shortened CBT-based intervention to treat procrastination in students. The results are promising and suggest that the shortened intervention is an effective treatment option that could be offered to university students in the future. However, a large-scale RCT with an active control group is needed to validate this study's findings (see below).

The second research aim of this study was to investigate whether the CBT intervention would also influence participants' mental wellbeing. It was hypothesized that the CBT intervention would indirectly improve mental wellbeing (Enns et al., 2015; Murray et al., 2016; Westerhof & Bohlmeijer, 2016) because many treatment components overlapped with those from interventions that directly target mental wellbeing (Dale et al., 2014; Locke & Latham, 2002; Murray et al., 2016; Räsänen et al., 2016). The results contradict these expectations. All participants improved from pre- to post- assessment, but there was no significant interaction effect. Thus, the hypothesis needs to be rejected.

The first possible explanation for these findings is that the intervention did not influence the mental wellbeing of the participants. It is conceivable that the CBT techniques employed were too focused on the problem of procrastinating so that they did not influence individual wellbeing. The main part of the intervention was focused on learning new skills instead of improving the individual's mood or self-confidence, which might have been necessary to improve the mental wellbeing of participants. Another explanation for the current findings can be that the effects on mental wellbeing require more time to appear (delayed effect). The participants' mental wellbeing may improve as a consequence of the intervention after they become aware of their success in managing their procrastination. Research by Schotanus-Dijkstra et al. (2017) showed that the effects of a theory-based intervention on wellbeing could increase after the end of the intervention. The researchers found that the effects on wellbeing rose from post-measurement to six months follow-up. Thus, in the current study, the possible effects on mental wellbeing could still increase to a significant level after the intervention. Therefore, future research should include follow-up measurements to check whether intervention effects are maintained over time and possibly even rise after the intervention.

Interestingly, although no significant interaction effect could be detected, there was a significant improvement in mental wellbeing from pre- to post-assessment in both groups. A possible explanation for this could be the season in which the intervention took place, during the meteorological transition from winter to spring. In 1989, Lewy proposed the *phase-shift hypothesis* (PSH) that suggests that a depressed mood in winter in patients with seasonal affective disorder (SAD) results from a phase delay of the circadian rhythm governing the sleep-wake cycle (Lewy et al., 2007). This entails that during winter when there is less light, the circadian rhythm can change, which is related to the sleep-wake cycle, and can influence patients' wellbeing negatively. In 2003, Murray, Allen, & Trinder confirmed Lewy's theory and demonstrated that a more depressed mood in winter was also observed in the general population. Thus, the wellbeing of the participants of the current study possibly improved in spring compared to winter. In line with this hypothesis, Wiens, Kyngäs, & Pölkki (2016) carried out a qualitative descriptive study on the impact of various factors, including seasonal changes, on girls' wellbeing. Participants were found to feel more social, happy and active during summertime and more depressed, isolated and lazy during wintertime. Thus, the timing of the pre-assessment of the current study during winter and the post-assessment during spring might explain why on average all participants showed improved mental wellbeing after the intervention. In conclusion, even though this study could not detect direct

effects of the intervention on participants' mental wellbeing, it has expanded current knowledge of possible ways to increase students' wellbeing. Further research is necessary to investigate potential delayed effects of CBT interventions on mental wellbeing.

Although the current findings are promising, they should be interpreted in light of possible limitations. First, the study was held during the Covid-19 epidemic. The World Health Organization (WHO) has characterized this disease as a worldwide pandemic (Cucinotta & Vanelli, 2020). This is a novel and unprecedented situation influencing peoples' lives in various and partially unknown ways (El Zowalaty & Järhult, 2020). Therefore, the results of the current study should be interpreted cautiously. The study needs to be replicated to validate the current results before conclusions can be generalized. Second, the main limitation of this study lies in the lack of an active control group. Even though it was carried out as an RCT, making the results interpretable, only a waitlist control group was included. This means that the current study might have controlled for spontaneous improvements over time, but it did not control for non-specific intervention factors such as therapist attention or researcher allegiance. This makes it possible that the detected intervention effects were not exclusively linked to the content of the intervention, but possibly also to random intervention factors (Cuijpers & Cristea, 2015). Therefore, further research is needed to validate the current findings. This research should include an active control group such as a supportive therapy group (Solanto et al., 2010), in which the participants have contact with a therapist and peers, to control for random intervention factors.

To conclude, this study provides deeper insights into the benefits of a short CBT-based intervention to reduce procrastination in a convenience sample of university students**.** It demonstrates that an abbreviated version of the original intervention shows significant and large effect sizes, with high attendance rates and low dropout. For that reason, this approach seems suitable for reaching many students and can achieve meaningful benefits. If future research validates the current findings, this intervention might be an effective and time-efficient tool that, if introduced into university settings, can help students reduce their procrastination within just a few weeks.

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