The Effects of a Cognitive-Behavioural Intervention Against Procrastination in University Students

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Abstract

Procrastination is a dysfunctional behaviour experienced by many university students. Due to negative consequences, such as low academic achievement and well-being, research has tried finding the underlying causes of procrastination. The key contributing factors (expectancy, value, impulsivity and delay) form the procrastination equation which is the core of the Temporal Motivation Theory (TMT). Based on this, cognitive-behavioural therapies (CBT) have been developed to reduce procrastination. Though effective, the intervention research so far had considerable limitations. These included few randomized controlled trials (RCT) and interventions with long durations and high drop-out rates. Thus, the current study adapted an existing CBT intervention to examine its effectiveness in reducing procrastination and enhancing well-being using an RCT. Seventy-one university students participated. They were randomly assigned to an intervention ($N = 37$) or waiting-list condition ($N = 34$). By using the *Pure Procrastination Scale* and the *Warwick Edinburgh Mental Well-being Scale*, procrastination and well-being were assessed before and after the four-week-long intervention/waiting period. As hypothesized, the results showed a significant time x group interaction regarding procrastination, meaning that the intervention group had a stronger decrease in procrastination from pre- to post-measurement than the control group. Contrary to the hypothesis, such an interaction was not found for well-being, meaning that the intervention was not effective in enhancing well-being. Nevertheless, this intervention turned out to be successful in reducing procrastination, showed a low drop-out rate, and was of short duration. This makes it cost-effective and therefore, after considering the limitations, it could be used in university settings to assist students struggling with procrastination.

Introduction

"*Only one more episode and then I will REALLY start doing my homework.*", "*Ah, I can just do it tomorrow.*". These are common examples of procrastination that most people have said at some point. Procrastination is defined as "voluntarily delaying an intended course of action despite expecting to be worse off for the delay" (Steel, 2007, p. 66), and is a problematic behaviour that can be found across different populations and cultures (Ferrari et al., 2007). However, especially among students, it seems to be common and severe, as approximately 50-70% of college students experience problems with procrastination (Küchler et al., 2019). It has been shown that procrastination behaviour results in lower grades, which predicts lower academic achievement (Gareau et al., 2019). Another study has shown that lower academic performance due to procrastination leads to lower well-being in

undergraduate students (Duru & Balkis, 2017). Furthermore, it has been shown that procrastination generally causes psychological distress and is related to depression and anxiety, which also has a negative influence on emotional well-being (Grunschel et al., 2013; Rozental, Forsström et al., 2018). Thus, it can be said that procrastination is negatively related to different aspects of well-being, especially in college students.

Due to these negative consequences of procrastination, research aims at explaining procrastination by examining the key contributing factors. A meta-analysis by Steel (2007) examined a wide range of factors in their potential contribution to procrastination. Based on the results, the *procrastination equation* has been proposed. This equation contains the factors that most substantially correlate with procrastination in the meta-analysis. It forms the Temporal Motivation Theory (TMT): Motivation = (Expectancy x Value) / (Impulsiveness x Delay). Motivation to execute a task or activity, therefore, depends on four factors: expectancy, value, impulsiveness, and delay. Expectancy represents the chance of how successful one expects to be in completing a task. The lower the expectancy of success, the higher the degree of procrastination. Value illustrates how rewarding the outcome of executing a task is. An example of value can be how fun a task is, with a less fun task (less value) leading to more procrastination. Impulsiveness represents the extent to which a person is sensitive to delay. If a person has a high level of impulsivity, they rather act on fun, short-term rewards (e.g. watching TV) than focus on long-term goals (e.g. studying for an exam). Lastly, delay is the time it takes to get a reward. A short delay is usually preferred over a long one, and tasks that are associated with a sooner positive outcome are less likely to be procrastinated than tasks with a delayed positive outcome. With this equation, it can be explained why people might choose to delay certain things to do more entertaining tasks, even though procrastination may result in negative consequences over time.

As procrastination is common and affects a variety of people in their well-being and daily functioning, different interventions to reduce it have been developed. These were reviewed in a meta-analysis by Rozental, Bennett and colleagues (2018). Generally, studies have used several different intervention approaches to reduce procrastination, such as acceptance and commitment therapy (ACT), self-monitoring, or cognitive behavioural therapy (CBT). The results have shown that CBT has been associated with moderate benefits, while the other approaches were not effective in reducing procrastination (Rozental, Bennett et al., 2018). This is in line with another meta-analysis suggesting that CBT reduced procrastination more than other intervention methods such as ACT (van Eerde & Klingsieck, 2018). The results of the meta-analyses should be interpreted cautiously, as only 12 studies

using a randomized control trial (RCT) were found, indicating a need for further RCTs. Furthermore, only three out of the four studies examining CBT were shown to be effective in reducing procrastination. Nevertheless, it has been suggested that CBT is the most suitable type of intervention, as it specifically targets different aspects of procrastination, such as time management, fusing, or goal-setting techniques (Rozental & Carlbring, 2014).

An example of an effective CBT intervention is by Rozental, Forsström and colleagues (2018). College students were randomly assigned to a self-guided internet CBT (iCBT) group or a face-to-face real-life group CBT condition. The content of the intervention was the same in both groups. For the iCBT group, the content was delivered as modules of 15 pages each. In the group CBT condition, two of the modules from the iCBT group, thus the same content, were discussed in each meeting. Generally, the content was based on the procrastination equation. This means that *expectancy, value, impulsiveness* and *delay* had central roles. More specifically, the intervention explored many different topics, including psychoeducation about procrastination behaviour, goal setting, managing maladaptive thoughts, or relapse prevention. These topics are linked to the TMT in several ways. For example, by learning to set realistic goals, the intervention tackles the variables *expectancy* and *value* (Steel & König, 2006). The participants experience that by concretely formulating goals, they will become more likely to reach this goal, which in turn enhances motivation and reduces procrastination. Furthermore, the variable *delay* is tackled if the main goal is divided into smaller sub-goals. If participants reward themselves for reaching those smaller goals, motivation to go on further is enhanced.

Concerning the structure of Rozental, Forsström and colleague's intervention (2018), the participants in the iCBT group worked individually. In the group CBT condition, the students met every two weeks for three hours each over eight weeks. The groups were held by clinicians giving psychoeducation and discussing the material and assignments with the students. The results have shown that at post-measurement, both groups have shown decreased procrastination, and increased well-being as compared to baseline. Despite the promising findings, the study has limitations that need to be considered. Firstly, the drop-out rates were high, with approximately 20% dropping out. There could be a difference between the participants finishing the study and the participants dropping out, which could influence the study results. Moreover, the high drop-out rates pose a clinical problem. Ideally, an intervention should be developed in a way that most participants complete it. A high drop-out rate in that study indicates that many participants are not able to finish the treatment, and would therefore eventually not get to the desired results. Also, the study did not include an

inactive control group, so it is unclear whether the effects can be attributed to the intervention or from non-specific treatment effects. The effects of the intervention must therefore be interpreted cautiously.

As Rozental, Forsström et al.'s (2018) intervention showed promising results, but also had considerable limitations, the question of the current study was whether an adapted version of their intervention would be effective in reducing procrastination. This was tested using a randomized controlled trial. It was predicted that the intervention group would show a stronger reduction in procrastination than the control group at the post-measurement as compared to pre-measurement. Furthermore, because it was shown that self-reported procrastination is negatively related to well-being (Grunschel et al., 2013), it was also examined whether the intervention affects well-being. It is of importance to study this effect, as many university students show decreased mental well-being due to mental health concerns like anxiety or depression (Watkins et al., 2012). Multiple factors can influence affective well-being in college students (Burris et al., 2009), with procrastination being one of them (Krause & Freund, 2014). Furthermore, it has been shown that CBT interventions can enhance well-being if the CBT skills are applied outside the sessions, such as it is done in homework assignments (Camacho et al., 2020). Therefore, if the intervention is effective in reducing self-reported procrastination, a greater improvement in well-being at post-measurement compared to pre-measurement is predicted in the intervention group as compared to the control group.

In order to test these hypotheses, Rozental, Forsström and colleague's CBT intervention (2018) (described above) was modified and used in this study. A control group (waiting-list) as a passive comparator has been added to be able to attribute changes to the intervention and not to spontaneous recovery. Moreover, the intervention (originally in Swedish) has been translated to English to reach a wider audience and has been shortened to make it less intensive, hoping to reduce the drop-out rate. If all the active ingredients of the intervention are included and work, a shortened version should be effective in reducing procrastination and enhancing well-being. University students from the Radboud University Nijmegen were recruited to participate in this study. The participants were randomly assigned to either an intervention group or a control group (waiting-list). Procrastination behaviour was examined at the pre- and post-measurement using the Pure Procrastination Scale (PPS; Steel, 2010) and well-being was measured using the Warwick Edinburgh Mental Well-being Scale (WEMWBS; Tennant et al., 2007). Over a four-week long period, in-between the pre- and the post-measurement, the intervention group received the adapted intervention in groups via

Zoom. The control condition (waiting-list), did not receive any intervention at that time. However, they were informed that they would receive the intervention at a later point. The goal of the study at hand is to gain better insight into the efficacy of CBT interventions against procrastination in college students. With this additional knowledge, existing interventions can be further improved or new interventions can be developed to help reduce college students' procrastination.

Method

Participants

In total, 78 students (age 18+) from the Radboud University in Nijmegen participated in the current study. The participants were recruited with the Radboud University SONA system. Before participation, they were asked to give informed consent. After the study, the participants received 6 participant points for their participation. The data of seven participants were excluded from the analyses as the data for the post-measurements of the PPS and the WEMWBS were missing, leading to a final sample of 71 participants. Of these 71 participants, 17 were male (24%), 54 were female (76%) and the age range was between 18 and 33 ($M = 20.76$; $SD = 2.41$). The participants were randomly assigned to two groups, the intervention group ($N = 37$) and a waiting-list control group ($N = 34$). In Table 1, the descriptive statistics for each group separately can be found.

Instruments

The following questionnaires were administered at the pre-measurement, and four weeks later at the post-measurement.

1. *Pure Procrastination Scale (PPS; Steel, 2010)*

The PPS was used to measure procrastination behaviour using 12 items. The participants were asked to indicate on a five-point Likert scale from 1 (*Strongly disagree*) to 5 (*Strongly agree*) how much the items generally apply to them. The total scores range from 12 to 60, with a higher score indicating more procrastination. The internal consistency is high (Cronbach's $\alpha = 0.92$) (Steel, 2010) and the convergent and divergent validity are good (Svartdal et al., 2016). Example items for this questionnaire are "*I delay making decisions until it's too late*." or "*I am continually saying "I'll do it tomorrow"*".

2. *Warwick Edinburgh Mental Well-being Scale (WEMWBS; Tennant et al., 2007)*

The WEMWBS measures well-being with 14 items. Participants respond to statements about their cognitions and emotions over the last two weeks. The answer

possibilities are on a five-point Likert scale ranging from 1 (*none of the time*) to 5 (*all of the time*). The total scores range from 14 to 70, with a higher score indicating higher well-being. The internal consistency tested in a student sample is high (Cronbach's α= .89), the content validity is good, and the questionnaire is less prone to social desirability compared to other scales assessing similar constructs (Tennant et al., 2007). For the WEMWBS, example items are "*I've been dealing with problems well*." or "*I've been feeling optimistic about the future*.".

Design

Intervention

The participants were randomly assigned to one of two conditions, an intervention or a waiting-list group. The intervention was based on the cognitive-behavioural intervention by Rozental, Forsström et al. (2018) as described above. It has been adapted to English to reach a broader sample and was shortened from four sessions of 3 hours each to four sessions of 2 hours each in order to reduce the drop-out rates.

Intervention condition

The participants in the intervention condition were divided into several groups that received the intervention, each consisting of approximately nine students. The intervention itself consisted of four weekly sessions of 2 hours, summing up to a total of 8 hours aiming to reduce procrastination behaviour. The structure of each session was as follows: First, homework assignments from the previous session were discussed, followed by an introduction of the new topic by the group leader. Next, in-session exercises with the group were conducted, in which participants were encouraged to share their own experiences and thoughts. Lastly, the homework for the next session was introduced to keep the students engaged outside the session.

Concerning the content of the sessions, the first session used psychoeducation to explain and introduce the concept of procrastination. Moreover, participants learned more about cost-benefit analyses, and they were asked to make their own analyses at home, next to their own *procrastination equation*. During the second meeting, it was explained how to set realistic goals and how to increase motivation. During this session, it has been shown that setting more meaningful goals increases satisfaction, which is related to the factor value in the procrastination equation. This, in turn, leads to a lower risk of procrastinating the task. Next to the importance of goal setting, the concept of behaviour activation was introduced. The homework assignment consisted of setting SMART goals related to their procrastination. This

means that they set goals that are specific, measurable, accepted, realistic and timed. In the third session, topics such as pseudo-work, effective time management and self-control ability were discussed. The group leaders explained that self-control ability is related to the inhibition of impulses and the regulation of cognitions and feelings. If a person engages in a task that costs mental effort, the self-control ability slowly declines. This leads to more impulsivity and the preference for more short-term rewards, which lead to procrastination. Recommendations on how to avoid the decline of self-control ability, such as doing small exercises and taking breaks, were discussed. Outside the session, participants were asked to do behavioural experiments and analyse their pseudo-work. In the last session, participants were informed about possible setbacks they might experience in their daily lives and how to deal with them. For example, they were told to monitor their progress and pay attention to the steps they take. In combination with SMART goals, this can lead to a higher level of expectancy, which lowers procrastination behaviour. The intervention ended with a reminder on how to maintain their progress and an analysis of the individual's risk factors.

Waiting-list condition

The participants in the waiting-list condition filled in the pre-measurement and were told that they would receive the intervention later. Between the pre- and post-measurement, no active task was given to these participants. After the post-measurement, the participants in the control group were offered the intervention too, so that they could benefit from it.

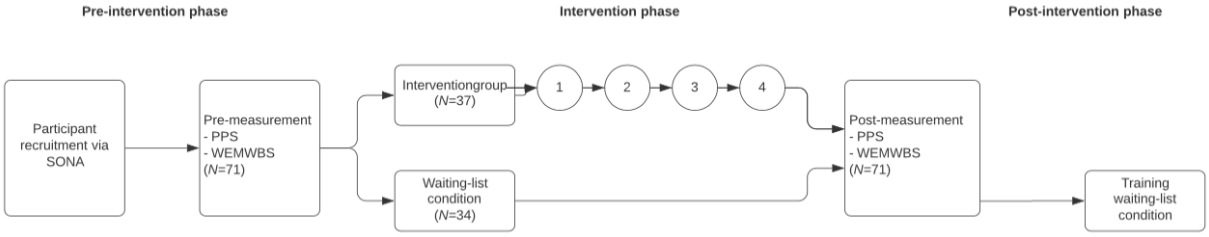
Procedure

For a visual representation of the procedure, see Figure 1. In the beginning, participants were recruited using the Radboud University SONA system. After reading the information letter and signing the informed consent, they were asked to fill in their demographic information and the PPS and WEMWBS on Qualtrics. Next, the participants were randomly assigned to either the intervention condition or the waiting-list condition. Participants in the intervention group were placed into one smaller sub-groups with approximately nine students in each group. The intervention consisted of four weekly sessions of two hours each and took place on Tuesdays between 15:30 and 17:30, or Wednesdays between 19:00 and 21:00. Due to COVID-19, the sessions took place online with PowerPoint presentations via ZOOM. On the day of the session, participants received a link for the ZOOM meeting. After the four-week-long intervention phase, the post-measurement data was

collected for the intervention, as well as for the waiting-list condition. After finishing the study, the participants were reimbursed with 6 SONA participant points.

Figure 1

Procedure of the current study



Data Preparation and Analysis

The data was collected using Qualtrics. The raw data was exported from Qualtrics to SPSS. Afterwards, the total scores for the pre- and post-measurement for the PPS and the WEMWBS were computed. For two participants, an item was missing in the pre-measurement of the WEMWBS. The missing items were filled in with SPSS using the mean of the other item scores.

To test whether the randomly assigned groups did not differ from one another on key variables during baseline, three t-tests and one chi-square test were used. The t-tests had group as the between-subject factor. The variables included were age, the pre-measurement of the PPS (quantitative; range: 12-60), and the pre-measurement of the WEMWBS (quantitative; range: 14-70). The chi-square test was used to examine whether the variable gender differs between the two groups.

Research question 1: Is an adapted version of Rozental's CBT intervention effective in reducing procrastination?

To test whether the intervention had an effect on procrastination, a repeated-measures ANOVA was conducted. The total score on the PPS (quantitative, range: 12-60) was used as the dependent variable, the between-subject factor was group (qualitative, intervention/waiting-list), and the within-subject factor was time (pre- and post-measurement). The group x time interaction answers this research question. Because the groups differed on age, this analysis was repeated with age added as a covariate. This way, it was examined if the intervention effect remained the same after controlling for age differences.

Research question 2: Does the intervention have a positive influence on well-being?

For the second question, another repeated-measures ANOVA was conducted. The between-subject factor was group (qualitative; intervention/waiting-list), the within-subject factor was time (pre- and post-measurement), and the dependent variable was the total score on the WEMWBS (quantitative, range: 14-70). Again, the group x time interaction answers the research question at hand. As in research question 1, the analysis was repeated with age added as a covariate to investigate whether the intervention effect remains.

Results

Participant baseline characteristics

The total sample (*N*=71) consisted of 17 males (24%) and 54 females (76%). The participants had a mean age of 20.76 years. In Table 1, the descriptive statistics (gender and age) of the participants are illustrated and the baseline measures of the PPS and WEMWBS for each group are reported. There are no significant group differences for gender and the baseline measures of the PPS and WEMWBS. However, the small difference in age between the groups was significant. It needs to be noted that two participants have not indicated their age and were therefore excluded from the t-test. Nevertheless, their data were included in the other analyses as all other relevant information was given.

Table 1

Descriptive statistics and pre-measures of the current study.

	Control group (N = 34)		Intervention group (N = 37)		
Gender (m/f)	10/24		7/30		$X^2(1, N = 71)$, $p = .30$
Variables	*M*	*SD*	*M*	*SD*	Group differences
Demographics					
Age	21.47	2.80	20.00	1.73	$t(67) = 2.53, p = .01$
Pre-measurements					
PPS	42.74	6.32	41.30	5.73	$t(69) = 1.00, p = .32$
WEMWBS	43.12	7.04	43.27	7.09	$t(69) = -.08, p = .93$

Note: *M* = Mean; *SD* = Standard deviation

Main analyses

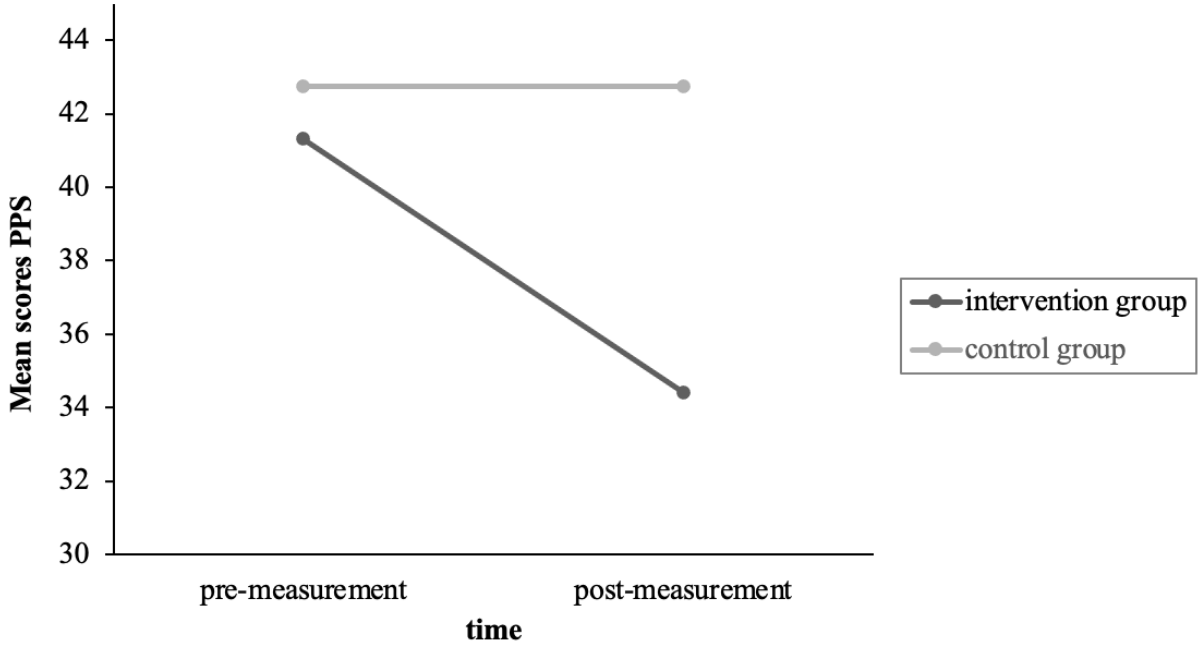
Research question 1: Is an adapted version of Rozental's CBT intervention effective in reducing procrastination?

A significant effect of group, $F(1,69) = 11.78$, $p = 0.001$, $\eta^2 = .15$, and a significant effect of time $F(1,69) = 35.94$ $p < .001$, $\eta^2 = .34$ were found. This means that the intervention group showed a lower mean on the PPS than the control group and that the PPS mean scores were lower at the post-measurement than at the pre-measurement. Furthermore, the time x group interaction showed a large significant effect Wilks' $F(1,69) = 35.94$ $p < .001$, $\eta^2 = .34$. The significant interaction means that the intervention group showed a significantly larger decrease in procrastination compared to the control group from pre- to post-measurement (see Figure 2). At the pre-measurement, the intervention group had a mean of 41.30 ($SD = 5.73$), which decreased to a mean of 34.41 ($SD = 7.06$) at the post-measurement. The control group had a mean of 42.74 ($SD = 6.32$) at the pre-measurement, which remained the same at the post-measurement ($M = 42.74$, $SD = 6.66$).

When adding age as a covariate, the time x group interaction remained large and significant, Wilks' $F(1,66) = 28.90$, $p < .001$, $\eta^2 = .31$.

Figure 2

Visualisation of the means of the PPS for the intervention and the control group on the pre- and the post-measurements.



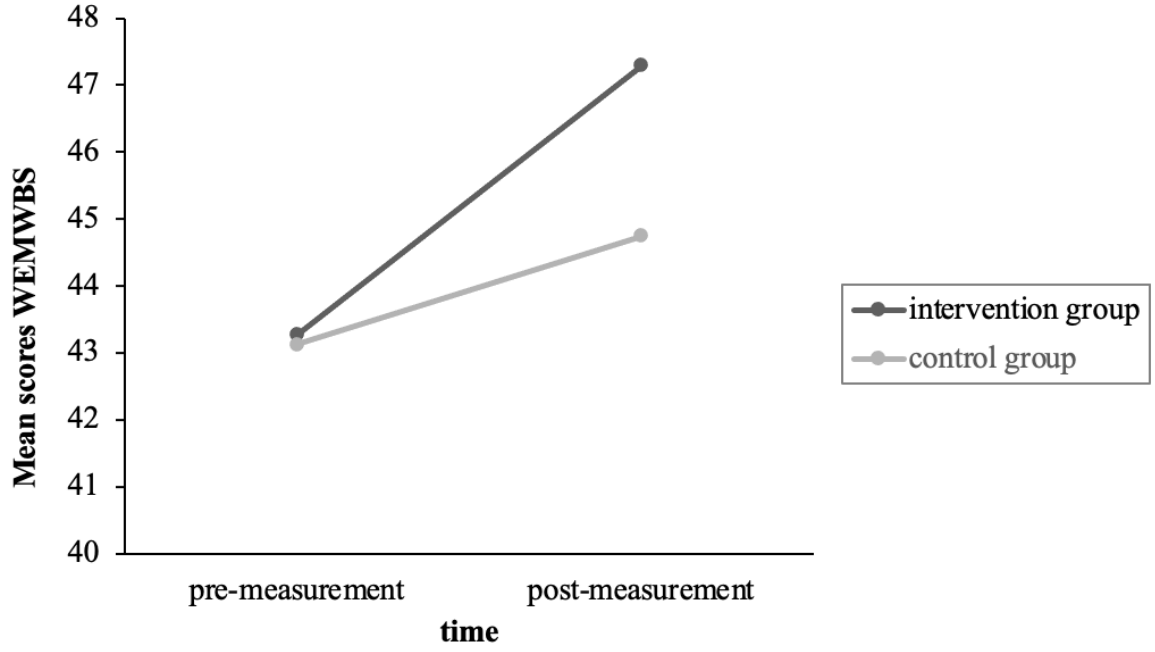
Research question 2: Does the intervention have a positive influence on well-being

There was no significant effect of group, F(1,69) = .65, p = .42, η^2 = .01, but a significant effect of time, F(1,69) = 16.39, p < .001, η^2 = .19 on well-being, meaning that well-being is significantly higher at the post-measurement than at the pre-measurement. Furthermore, there was no significant effect of the time x group interaction, Wilks' F(1,69) = 2.99, p = .09 η^2 = .04. This means that the increase in well-being from post- to pre-measurement as observed in the intervention group was not significantly larger than in the control group (see Figure 3). When adding age as a covariate, the time x group interaction remained non-significant, Wilks' F(1,66) = 1.27, p = .26, η^2 = .02.

At the pre-measurement, the intervention group had a total WEMWBS score of 43.27 *(SD* = 8.13), while the control group had an average total score of 43.12 *(SD* = 7.04). At the post-measurement, the average scores for the WEMWBS for the intervention and the control group increased to 47.29 *(SD* = 8.66) and 44.74 *(SD* = 6.64), respectively.

Figure 3

Visualisation of the means of the WEMWBS for the intervention and the control group on the pre- and the post-measurements.



Drop-out rate

Out of the 78 participants, 7 participants did not fill out the post-measurement, and are therefore counted as drop-outs. This means that the drop-out rate in this study is at 8%.

Discussion

The main goal of this study was to investigate whether an adapted version of Rozental and Forsström et al.'s (2018) CBT intervention can reduce procrastination in university students. Compared to Rozental's intervention, the intervention at hand was translated into English and was shortened. The participants were randomly assigned to a passive waiting-list condition, or to an intervention condition. The intervention consisted of four weekly two-hours long sessions given by the group leaders online. Following the sessions, homework assignments were given. The waiting-list condition received no sessions or tasks and participants were asked to wait for the training period. The goal of the study was to see whether an adapted version of Rozental's study will be effective in reducing procrastination and enhancing well-being. The first hypothesis, namely that the intervention group would show a stronger reduction in procrastination behaviour than the control group at the post-measurement as compared to pre-measurement was supported. However, the second hypothesis that there would be a significantly greater improvement in well-being at post-measurement compared to pre-measurement in the intervention group as compared to the control group, was rejected.

The results of this study show that the intervention was effective in reducing procrastination and therefore support the first hypothesis, and replicates the results of the original intervention (Rozental, Forsström, et al., 2018). The current study therefore shows that a relatively short CBT intervention (4 times 2 hours instead of 4 times 3 hours in the original intervention) can have a beneficial effect on university students in reducing procrastination with a large effect (*partial eta squared* = .34). These findings may be understood in the context of the *procrastination equation*, as proposed by Steel (2007), as the intervention was built on this theory. Several of the topics discussed during the intervention have a direct relation or aim to tackle the key factors of this procrastination equation, namely *expectancy, value, impulsiveness,* or *delay*. As examples, it has been shown during the sessions how to prevent impulsive decisions by taking breaks, or how to increase the value by rewarding smaller steps one takes on the way to achieve a higher goal. By sticking to the theoretical background and educating the participants on how to apply the equation in a real-life setting, the intervention combines theoretical and practical knowledge. Moreover, research has shown that homework compliance is an important factor influencing treatment outcomes (LeBeau et al., 2013). By regularly giving the participants homework assignments, the participants are more deeply engaging with the content and have a better chance of internalizing and improving.

To measure the effects on self-reported general procrastination, the PPS was used in this intervention. Even though the PPS has good psychometric properties, such as an internal consistency of Cronbach's $\alpha = 0.92$ (Steel, 2010), it is not the only questionnaire measuring procrastination. Other measurements have also been developed to assess procrastination, such as the Irrational Procrastination Scale (IPS; Steel, 2002) or the Motivational Diagnostic Test (Steel, 2011). Considering the aim of the current study, namely to measure whether the intervention is effective in reducing procrastination, the PPS was adequate to use. However, it could also be considered using a different questionnaire, such as the Motivational Diagnostic Test (Steel, 2011). Compared to the PPS, the Motivational Diagnostic Test has the advantage that it is also based on the TMT and examines the factors impulsivity, expectancy, and value (Steel, 2011; Wypych et al., 2018). This way, it would be possible to assess whether the current intervention, which was also based on the TMT, was successful in improving these factors. With this, it could then be more thoroughly examined whether there is a link between the TMT as proposed in the literature and the intervention based on it.

Another noteworthy point of this procrastination intervention is that it was an RCT with a passive comparator as the control condition (waiting-list). This way, it can be concluded that the improvements in procrastination in the intervention group cannot be attributed to spontaneous recovery. In contrast, in Rozental's original study, two active groups received the training. Therefore, it was unclear whether the changes were due to the active ingredients of the intervention, or other non-specific intervention effects such as receiving attention from a therapist. It would be important for future studies to add another, active, control group. This way, it can be determined whether improvements due to this intervention can be attributed to the *active ingredients* of the intervention, or rather to non-specific factors such as being part of a group and exchanging with a therapist. An alternative control group should be similar to the intervention group, thus meet in a group regularly with a group leader. However, the content of this control group should differ in order to see whether the changes in procrastination can be attributed to the active ingredients of the intervention.

In addition to the effects of the intervention on procrastination, we observed that the drop-out rate in the current study was relatively low (8%), while in Rozental's original intervention, 19.6% of the participants dropped out. This may be best interpreted as a result of the shorter session durations. However, because the group sessions were online due to the lockdown rather than face-to-face as originally planned, it could also be that the lower drop-out in this study was due to the online format. Further, in the original intervention, 33.70% of the participants showed an improvement on the PPS. In comparison, in our study, 31 out of 37

participants (83.80%) from the intervention group improved on the PPS at post-measurement. On the five-point scale, Rozental's intervention led to a reduction of 0.80 points on the PPS, while our intervention group reached a reduction of approximately half a point (0.57). Comparing the two interventions, it seems that in Rozental's intervention, a smaller proportion of participants improve, but those improving do so to a higher degree than participants in our study (0.8 compared to 0.57 points). Considering this trade-off, we think that the results of the current study are more desirable. When using the adapted intervention, more people can benefit from it as it is more accessible due to the shorter duration and the fact that it is online. Further, an effect size of 0.57 points still shows a substantial decrease in self-reported procrastination.

Our study had crucial adaptation and changes made compared to Rozental's intervention which could account for the additional effects found. Firstly, the study at hand was translated into English. This way, it is possible to reach a broader audience and make it more accessible for more students. Furthermore, the intervention has been shortened in time. It was chosen to shorten the intervention to reduce the original drop-out rate, which has been achieved successfully. However, it is yet unknown whether the reduced drop-out rate is due to the shorter intervention, the online format, or even both. Summarizing, it can be said that the intervention at hand is, compared to the original intervention, a short, widely accessible intervention with a large effect size, a low drop-out rate and most participants improving in procrastination.

Our findings concerning procrastination also have implications for clinical practice. It needs to be noted, however, that procrastination is not considered a mental illness and there are no tools and cut-off scores yet to determine when procrastination could be harmful to a person. Nevertheless, it is still important to tackle this behaviour. The majority of students struggle with procrastinating and experience negative consequences, which can eventually lead to psychological problems such as anxiety (Abdi Zarrin et al., 2020). As discussed, the current intervention has demonstrated clear benefits. Furthermore, as no therapist is needed to lead the groups, the intervention is cost-effective. Schools and universities could therefore consider offering this intervention to their students. This way, students who feel like they experience problems with procrastination can receive help if needed. This in turn could hopefully improve further outcomes in their lives, like higher academic achievement and less psychological distress.

Next to the self-reported procrastination, well-being was used as a secondary outcome measure. Earlier research has shown that less procrastination is associated with higher well-

being (Duru & Balkis, 2017). Therefore, it was hypothesized that well-being will be higher at the post-measurement in the intervention group than in the control group. The current results have not supported this hypothesis, and did not replicate Rozental, Forsström and colleagues' (2018) original results, as the time x group interaction was not significant. However, as seen in Figure 3, the direction of the interaction effect is as expected. Several explanations could explain this result. The main explanation is that the intervention is primarily developed to reduce procrastination, and not directly focused on improving well-being. However, we had predicted that the improvement in procrastination would result in increased well-being. While it did, also the control group increased in well-being. This may be because the control group knew they would receive the intervention after the post-assessment. They may have been anticipating the intervention. Thus, in order to assess the effects on well-being, a design might be needed in which the control group does not know that they will be offered the intervention. Another explanation could be that the intervention was too short to see a significant effect on well-being. If the intervention was longer than four weeks, it might be that the results would become significant. It could be that well-being would improve later if the procrastination behaviour was reduced for a longer while and when the benefits in other domains of their lives would be more noticeable for the participants. This improvement would only be noticeable during a follow-up measurement. This would be in line with other research showing that well-being can still improve after several months, and can still improve at a 12-months follow-up measurement (Schotanus-Dijkstra et al., 2017).

The current intervention has many benefits, but there are limitations of this study that need to be considered. Even though a statistically significant decrease in procrastination has been found with a large effect size, it is to be discussed whether this reduction is also of clinical relevance. It is unclear whether a reduction of 0.57 on a 5-point Likert Scale is noticeable for the participants in their daily life, beyond the direct responses on the PPS. Future research should therefore also lay the focus on the clinical relevance of the intervention. Participants could be asked whether they notice any changes with regards to procrastination more broadly in their daily life (e.g. better academic outcomes, stress, anxiety) after the intervention and whether their general suffering as a result of procrastination has decreased. In other words, it should be examined how far-reaching the impact of the intervention is. Next, as mentioned above, a follow-up measurement is needed. Due to the missing follow-up measurement, only immediate effects of the intervention can be currently seen. If a follow-up measurement is added, it can be examined how long-lasting the effects of the intervention are. This way, it could also be determined whether a booster-session could be

necessary to refresh, enhance, or maintain the effects (see for example Solanto, 2011), as booster-sessions have been shown to improve CBT treatment outcomes (Gearing et al., 2013; Schlup et al., 2009). Furthermore, it could be tested whether the effect on well-being would manifest after a longer follow-up period. Another interesting proposition for further research is to add an active control group next to a passive comparator. In an active control group, participants would also receive group sessions and homework assignments. However, the content of the sessions would be different as the active ingredients would be excluded (i.e. no session related to the *procrastination equation*). This would clarify whether the observed effects here can be attributed to the *active ingredients* of the intervention.

In conclusion, it can be said that this study contributes knowledge to the development of interventions against procrastination. The study at hand has shown, using a RCT, that the intervention is successful in reducing procrastination in college students. If other researchers replicate this study using a bigger sample and with an active control group, this intervention could ideally be further improved and offered to students in university settings.

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