Procrastination and its mechanisms

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Abstract

When procrastinating, an individual fails to regulate his behaviour towards achieving an intended goal. This common and prevailing phenomenon can occur in almost all domains of life and on a wide variety of tasks. However, it is highly personal what tasks people procrastinate on, and whether dilatory behaviour is in fact procrastination depends on individual reasons. As such, it is often measured with self-reports. Given that there is no uniform theory on what exactly constitutes procrastination, this thesis aims to establish a theoretical framework based on philosophical and psychological literature. By looking at underlying mechanisms of procrastination, this thesis lays the groundwork for an experimental study that aims to induce procrastination in a lab setting. To achieve this, firstly a notion of what behaviour we want to observe is created. Specifically, cases of delay that may or may not be called procrastination are discussed. Secondly, in approaching procrastination as a self-regulatory failure, the psychological mechanisms that can be influenced to induce procrastination are discussed.

Content

Introduction

Like other animals, humans respond to impulses and can act goal oriented. Furthermore, humans can relate to the world by reasoning in a way that no other animal can; they can perform intentional actions that serve future goals. On the flipside this implies that an individual's goals regulate his actions (Latham and Locke, 1991). Apart from planned actions, individuals are exposed to many temptations and short-term desires that can instantly gratify them, such as food, alcohol, parties, vacations or sex. However, humans seem perfectly capable of exerting self-control in the case of impulses or gratification of desires and needs (Hagger et al, 2010). The self control that humans possess is a kind of behavioural regulation which enables them to plan ahead in order to achieve long term goals. When an individual delays well considered choices for more pleasant or easier tasks while being worse of all things considered, we speak of procrastination (Latham and Locke, 1991; Vohs and Baumeister, 2004).

Procrastination is a well-known concept that virtually everyone has experienced at some point in his or her life. Up to 46% of college students report that they have consistently procrastinated on specific academic tasks, and about 15% of the general population is chronically affected (Solomon & Rothblum, 1984; Harriott & Ferrari, 1996). As a widespread and daily phenomenon, procrastination can easily be overlooked or attributed to other causes. Clearly however, not being able to realise the ideas and goals we have, can have a profound impact on our experience as autonomous beings. Aside from stress and bad performance on tasks we in fact think of as important to us, it can lead to mistrust in our own doings and a preference for easier and less demanding tasks (Harriott & Ferrari, 1996). As such, procrastination can lead to anxiety and depression (Knaus, 1973; Steel, 2007).

Despite a large body of research on the topic, findings on procrastination seem inconclusive, and its causes and effects are opaque (Steel, 2001). In part, this seems to be related to the fact that most research on procrastination is measured with self-reports. This should come as no surprise, as what people procrastinate on depends on what task or decision they personally experience as unattractive, and this can vary widely; from making future plans, to cleaning, paying bills or doing sports (van Eerde, 2000). This subjective nature of procrastination is a good fit for self-report measurements as opposed to observational measures in a laboratory setting. However, as Steel et al. (2001) showed: findings on correlates of procrastination differ when observable or self-reported procrastination criteria are used. This suggests that self-reported data not only reflect actual behaviour but are also liable to self-assessment

(Steel et al. 2001; DeWitte & Schouwenburg, 2002). Given the large amounts of research already conducted, this has given rise to the idea that it might be more fruitful to look for observational criteria and measures of procrastination. It would entail taking a more process-based approach, focusing on the similarities, not the differences, of individuals (van Eerde, 2001). Few studies have used experimental designs. However, their setups tend to focus on monitoring behaviour on tasks of personal relevance, and often not in a laboratory setting. Others employed a lab setting, but focus only on chronic procrastinators (Ferrari, 2000; Van Eerde, 2001). Some studies have successfully induced procrastination in an experimental setup (Tice & Bratslavsky, 2000).

With this in mind, this thesis applies concepts from philosophy (in which the strongly related topic of 'weakness of will' is a classical problem) and psychology alike, and looks at the mechanisms that can be influenced to induce procrastination in a laboratory setting. In a separate experimental part, behavioural interventions were tested in a lab setting in order to gain insight into how procrastination can be induced in a laboratory. These results are presented in "Inducing procrastination in the Lab: An exploratory study" (2015).

The approach of this theoretical framework is twofold. First, it aims at establishing insight into the observational aspects of procrastination. Second, it serves as substantiation for the choices made in the experimental part of this thesis.
As there are many types of delay, some of which procrastination, Chapter 1 will focus on what dilatory behaviour should be labelled procrastination. In Chapter 2 procrastination is approached as a failure in self-control. It discusses mechanisms that can be addressed in order to induce procrastination in a laboratory setting. As such, it doesn't give an exhaustive list, but explores what mechanisms seem well suited for implementation.

As this thesis combines philosophical and psychological insights on the topic of procrastination, it contributes to the field of Artificial Intelligence by integrating knowledge related to procrastination. Specifically, it touches upon the unique human qualities of cross-temporal planning and rationality. A better understanding of procrastination can verify and improve simulations of agent models. As a personal motivation, the observation based approach of this thesis supplements the generally more analytical and logics based approaches of AI courses. It gives first-hand experience in the pre work of the computational models I will focus on in the master program IT & Cognition.

Chapter 1 observational aspects

This chapter is concerned with what kind of behaviour should, and what kind of behaviour should not be labelled procrastination. There are many approaches and opinions regarding what procrastination is. Apart from the scientific community, it is also prevalent in mainstream media and blogs. As such, the term 'procrastination' is used in all kinds of situations whether appropriate or not. Whereas it can be said that procrastination involves a type of delay, some people intentionally delay work until the last moment, as they prefer to work under pressure. Regardless of the question of whether this is a smart strategy, such rational delays should be excluded. The simple conception of procrastination as 'putting off longer than a person judges best' also doesn't suffice. When an individual is surfing the Internet and afterwards regrets having not spend his time more wisely, one can wonder whether such cases of indecisiveness should be labelled procrastination. The definition "to voluntarily delay an intended course of action despite expecting to be worse off for the delay" (Steel, 2007), does not incorporate situations in which procrastinators apply techniques by which they intentionally put limits on what they know; as such never fully committing to actions or goals. For example, when having to learn for an exam, an individual can decide to start learning two days in advance. As such, he can start on time and at that point 'realise' he has to read 3 whole books, a task not doable in 2 days. Such cases seem open to rational criticism as one willingly seems to work against achieving one's goals.

Whether a delay should be labelled as procrastination also depends on the reason an agent has for not following up on his plan. The validity of these reasons differs for different people and in different situations. If a previously made intention does not serve an agents goal anymore as it did before, it can be rational to delay. Such changes also include internal changes. When intending to finish a certain project for instance, it can be a rational choice to go for a 10-minute walk after a few hours of work and delay the intended action. Afterwards the person can work more efficiently, and thus achieve his goal quicker and with better result.

In order to get a grip on different takes on procrastination as well as on how different cases can be interpreted, this chapter is concerned with interpreting what dilatory behaviour should be labelled procrastination and what factors are involved. It will start by giving more theoretical notions of the concepts involved, by discussing Agency over time (§1.1) and Weakness of will and Akrasia (§1.2). Scepticism and Hyperbolic Discounting addresses the question if procrastination is not mere hypocrisy (§1.3) and under The Unwilling Addict (§1.4) I will discuss and analyse cases in which free will seems impaired.

1.1 Agency over time

"Never put off till tomorrow what you can do today." (Thomas Jefferson)

Whereas at first glance this might seem good advice for procrastinators, it fails to address a central aspect of human nature, namely that many of the goals we want to reach involve long-term plans. It is not only unnecessary to do everything now; it would impair our agency over time. With our capacity to reason, humans can conceptualise goals and think in terms of long-term plans. These long-term plans make it possible to achieve complex goals over time. With our practical rationality[1] we can not only deliberate on our actions given a certain situation and certain goals; we are also motivated to take actions in accordance with these goals (Bratman, 1987). Once we have formed a goal intention, we can consider the actions we have to perform in order to achieve these goals. This means our plans are typically temporally extended. Also, plans are often partial in nature (i.e. at the moment at which someone decides to travel to Berlin, he doesn't have to decide what he is going to pack). As such, it is a central aspect of effective human agency to delay certain choices or actions to later points in time. However, as we have many goals that involve different time frames, our plans exist in a complex network of interrelated hierarchical plans (Bratman, 1987). In order to actually achieve our goals, we have to stick to the intentions we make. By shaping our intentions into plans, they also restricts further reconsideration and planning, which is vital in order to be effective agents (1987). Without new information, it is rational to stick to the previously formed intention of performing action A at time *t*. It can thus be said that future-directed intention carry a commitment to achieve the respective goal: When time *t* comes, we don't have to re-evaluate the plan and can act on our intention (Bratman, 1987). In many cases of procrastination however, when time *t* comes, instead of doing A, we freely chose to perform an action B after which we know we will (all things considered) be worse off. As such, procrastination defeats the purpose of planning, and procrastination can be seen as an impairment in agency over time.

The idea of keeping one's actions in line with one's goals, originates from the classical philosophical conception of weakness of will. Whereas it has been argued that the will is a myth (Ryle, 1949), willpower is commonly used to designate the cognitive process of deliberating over, and committing to, a particular course of action

[1] This normative rationality can be differentiated from theoretical rationality, that is; the ability to reason about, and reflect upon, theoretical problems focussed on what one should consider true (Wallace, 2014).

(Kamphorst, 2014). Intentions can be related to the will, as they direct an agent's behaviour towards realising his goals. As such, one chooses a plan and does one's best to realise it and shape the world such that this will be possible (Bratman, 2009; Wilson and Shpall, 2012). In such cases an agent is said to "exert strength of will" (Zhu, 2004). Procrastination resembles weakness of will and the related concept of akrasia in many respects, and one can wonder whether procrastination is an instance of either one.

1.2 Weakness of will and Akrasia

Humans are planning agents that use delay as a method of planning. (We cannot do everything at once!). Critical is, that the agent delays something he *in some sense decided he has to do*. As such, there is a dissonance between the action and the judgment of an agent (Davidson, 1980; Stroud, 2010). He is then said to lack the willpower to do what he believes would, all things considered, be better (Davidson, pp. 21). Akrasia or 'acting against one's better judgment' has classically been used as a synonym for weakness of will (Davidson, 1980; Stroud, 2010). In the following part this account will be discussed. Afterwards a different definition will be discussed.

It is not uncommon for a human to succumb to impulses or distractions once in a while, in spite of having considerations regarding what one 'should do'. For instance, imagine going shopping for dinner whilst having a judgement about having to eat ecological food. On your way there, you are seduced by the smell of the very thing you are trying to resist. Contrary to your judgement, you might end up at a snack bar. Such instances of rational failing are called 'akratic' or 'weak willed'[2]. The main objective against seeing procrastination as akrasia or weakness of will in this sense is that with akrasia an agent deliberately does something *against his better judgement* whereas procrastination seems to be about *not following through on one's intentions* (Holton, 1999). Stroud (2010) distinguishes as a deeper reason that akrasia is always about a discrepancy of judgment and action at a certain time 'x', whereas procrastination necessarily seems related to extended agency over time as he is putting something off at time 'y' that he at time 'x' planned to do at time 'y' (pp 59).

A more modern account of weakness of will seems to better fit these prerequisites. Where akrasia refers to 'going against one's better judgment', weakness of will in this case, is the failure of doing what you decided to do (Holton, 1999; McIntyre, 2006). Under this view, it is possible to be akratic without being weak-willed. When someone judges it best not to cheat on an exam, but in order to pass an exam

[2] What the nature is of weakness of will and if it is possible, is on is a traditional philosophical question, involved in many debates. Also see Stroud, 2014.

forms the intention[3] to cheat anyway and sticks to this intention, the person behaves akratically without showing weakness of will. In cases of weakness of will, it doesn't matter what an agent judged best at the moment he failed to act on his previously formed intention; it is the abandonment of the plan itself that counts (Holton, 1999; McIntyre, 2006). This account of weakness of will doesn't carry the evaluative judgment about what the agent thinks is best, but it is concerned with what he intended to do; where akratic action is concerned with a position of the agent (viz. a judgment) at the moment of the delay itself, weakness of will refers back to a prior state (viz. a previously formed intention) (Stroud, 2010). Weakness of will is still characterised by a rational failing, but now by defeating the purpose of future directed intentions (i.e. coordination of different plans over time and coordinating with other agents), by not acting on them. Procrastination strongly resembles this account of weakness of will. However, it excludes cases in which one never formed a clear intention to do 'x'. One is thus never weak willed when not doing 'x' if one only never really plans to do 'x' (Stroud, 2010). This leaves the door open for vague and undemanding intentions (McIntyre, 2006).

In defining procrastination, weakness of will doesn't suffice. We want to include cases in which we can speak of bad goal design due to for instance vagueness or unclear intentions can be included (Gollwitzer and Brantstaetter, 1997). A practical tool that is successful in reducing procrastination by implementing 'if-then' plans, reveals that aside from not following up on previously made intentions, people often don't frame their goal content clear enough (Gollwitzer and Brandstaetter,1997; Parks-Stamm and Gollwitzer, 2009). Especially in cases of aversive goals or low goal identification, it can be tempting to focus on other things and as a consequence be overwhelmed by the task at hand when the time comes to act on a goal (Parks-Stamm and Gollwitzer 2009).

The cases discussed up to this point involve a failing in agency over time or a self-regulation failure. This can be summarized as fulfilling four criteria that can be use to judge if behaviour is procrastination: *"A person has to (1) commit to the goal in question; (2) have the opportunity to act on the goal; (3) expect to be worse off later in the case of a delay; and (4) voluntarily decide to put off the intended action or inaction until a later point."* (Wieber en Gollwitzer, 2010, pp. 185).

[3] Holton speaks about resolutions.

1.3 Scepticism and Hyperbolic Discounting

When stating that one voluntarily delays, it raises the question if procrastination doesn't merely involve an excuse for not really wanting to achieve a goal. Within the assumption that humans have free will, we assume that they were in a position to freely decide to do as we intended, or alternatively, to chose another course of action. When people have the freedom to choose what they want and are in a position to act on their goals but nonetheless chose to do otherwise, it could simply involve hypocrisy. Such scepticism is defended by the rational choice theory. In this classic behavioural-economic theory people are expected to always maximize utility. In a deliberation process they assess their options, and act on the most profitable options. As such, what was called procrastination can be revealed as a goal one might have presented as wanting, but that was never important enough to act on. There might definitely be such cases. However, recent models of behavioural-economics such as hyperbolic discounting (Monterosso and Ainslie, 2007) or intransitive preference (Andreou, 2007) have room for 'real' procrastination.

The sceptical position leaves out an essential aspect of reaching goals; its temporal aspect. Achieving goals generally involves making many choices and performing multiple actions over a course of time. The theory of hyperbolic discounting explains how it can be that –even though we want to reach certain future goals, this never results in acting on them 'now'. The theory states that motivation for a certain goal is not consistent over a time; delay and motivation are not related in an exponential way. This leads to the consequence that an individual can prefer different outcomes at different times in relation to a desired goal (Monterosso and Ainslie, 2007). A vast amount of typical behavioural-economic experiments have shown that time in relation to expected outcome behaves hyperbolic as the value of an expected outcome is greater as one is closer to that outcome (2007). This can explain why a person prefers immediate but inferior rewards over the outcome of long term goals. This theory implies that we need self-control in order to not always give in to our highest temporal preference. As such, that people can have goals they never get around to act on. Concluding real procrastination is possible, the criterion of 'voluntary delay' still is opaque. In what follows an attempt is made at clarifying this criterion.

1.4 The Unwilling Addict

In terms of Frankfurt we can distinguish between when a person has a desire to do something and also wants to have this desire, and a person who wants to have a desire, even though he doesn't have the desire to do the thing itself (Frankfurt, 1971, pp

9). His example of a physician who treats narcotics addicts, describes a physician who believes his ability to help his clients would be enhanced if he only knew what it is like to have a desire for drugs. In really wanting to know what it is like to be moved by the desire to take drugs, we can say he has a second-order desire. However, it might also be true that he does not want this desire to be effective, as he does not want to act on it (1971). Taking the drug would not satisfy his desire, as his desire is to want to want to take it. At the same time we can imagine that he does not want to take drugs, or is even appalled by it. Such a person can be said to have a second-order desire, but no first-order desire, and as such he is not committed to acting on his preference[4].

Now consider one of his patients who is satisfied with his addiction. He has the desire to take drugs (a first-order desire) and also wants to want to take drugs (a second order desire). In this case we can say he willingly wants to take the drugs: he wants the desire to take drugs to be the desire that moves him effectively to act (1971, pp 10). This is called a second-order volition. The related desire is motivating or moving him to do as he wanted (Frankfurt, 1971). Let's consider another addict, who has among his first-order desires the desire to take drugs and the desire to refrain from taking drugs. He also has the second-order volition to not want to want to take drugs. This 'unwilling addict' could for instance also have the second-order volition to take his family on a road trip along the coastline. In order to do this he needs to buy a car. However, at any point that he saved some money to buy the car, he is overtaken by his desire to take drugs and delays buying a car in order to buy drugs. The unwilling addict is (1) commit to the goal in question, (2) has the opportunity to act on the goal, and (3) expects to be worse off later in the case of a delay. However, he doesn't seem to (4) voluntarily decide to put off the intended action or inaction until a later point[5]. As he is doing whatever he can to realise his second-order volition but is torn up between his desires, we can say the addict is not free 'to will' (Frankfurt, 1971). This leads to the question if criteria 4 should be a prerequisite for procrastination.

In cases of drug, alcohol, sex or gambling addictions, just as with psychological impairments such as diagnosed depression, anxiety disorders or compulsive disorders, one can wonder if we want to call its resulting dilatory behaviour, procrastination. As the steepness of the discount curves can differ for individuals, an addict experiences a

[4] In most cases a first order desire and a second order desire lead to a second order volition, and as such an individual will act in accordance with his volition. However, Frankfurt distinguishes the case of a human without a will. As he has no will, he lacks autonomy and as such can not be considered a person.

[5] Based on the assumption that the physiological conditions underlying addiction periodically inevitably overtake addicts (Frankfurt, 1988a, pp. 12).

much steeper curve than a non-substance abuser (Ainslie, 1975). As there short-term gains are disproportioned to long-term wins, self-control is much harder. 'Voluntariness' thus involve a scale that does not have a clear border (Baumeister and Heatherton, 1995). Addictions and other disorders strongly resemble akrasia in that they involve the judgement that 'action A is better than action B' but the agent still performs action B. However, we can imagine cases in which individuals report they could not have behaved otherwise. If this seems to be the case even under strong pressures, such cases could be labelled 'involuntary', and as such not count as procrastination. In these cases, dilatory behaviour can be regarded a symptom of another impairment. Aside from clear cut voluntary cases, a category with 'less voluntary' cases could include mild cases of addictions and disorders, or types such as Internet or TV addictions, eating disorders, compulsive shopping or sporting addictions. In such cases people might report that they can't follow through on their intentions, but when under extreme pressure, are able to do as they intended. Whatever guidelines are followed, it seems inevitable that some cases will have to be individually assessed. Take depression and anxiety: both can be a result of procrastination as well as a cause of procrastination in individuals previously not exhibiting dilatory behaviour (Steel, 2007). In some definitions, voluntariness is more specifically incorporated. Kroese et al., (2014) state that procrastination involves failing to do as one intended "while no external circumstances prevent a person from doing so". However, the above discussion suggests that it might be useful to expand such definitions to include internal factors.

Chapter 2 Causes and Mechanisms

Psychologists and economists alike have strengthened the scientific justification for the concept of willpower due to research into the mechanism of self-control, for instance on individuals with poor financial self-control or on those who suffer from addictions (Monterosso and Ainslie, 2007). As such, procrastination is mostly approached as a cluster of (lack of) self-control[6] or as a self-regulation failure (e.g. Baumeister and Heatherton, 1996; Steel, 2007; Sirois & Psychyl 2013). Baumeister et al., (2007) states: "Self-control can be viewed as a specific case of self-regulation in which the person exerts deliberate and conscious effort to control the self, while self-regulation is a global term that also encompasses reflexive and non-conscious regulatory processes such as homeostasis." Potential explanations of procrastination, such as temporal discounting (Monterosso and Ainslie, 2007), task-aversiveness (Blunt & Pychyl, 2000), fear of failure (Schouwenburg et al, 2004), self- handicapping (Ferrari, 1991) or traits procrastination (Schouwenburg & Lay, 1995), all explain procrastination as a shortage of self-control (Wohl, Pychyl & Bennett, 2010).
After reviewing the main causes of procrastination (§2.1), this chapter will discuss how mechanisms of self-control can be used to influence procrastination through emotional regulation and short-term mood repair (§2.2) and through ego-depletion (§2.3).

2.1 Causes

Generally, causes are classified under task-characteristics and motivational aspects. About 50% of people reported that their procrastination was due to some task characteristic (Briody, 1980). Two main factors have been suggested: timing of rewards and punishments, and task-aversiveness (Steel 2007). Task-aversiveness refers to an unattractive action which one tries to avoid. It generally causes procrastination by resulting in a bad mood or (perceived) tiredness, which in turn leads to a self-regulation failure (Blunt & Pychyl, 2000; Pychyl, 2013). Procrastination is likely to occur when tasks are frustrating, boring, difficult, ambiguous or when they lack personal meaning or intrinsic reward. In relation to motivation it is thought that intrinsic as opposed to extrinsic motivation is more effective in goal striving (Ryan & Deci, 2000). On its own, task-aversiveness leads to task avoidance, but in relation to timing of reward and punishment it can account for task delay (Steel, 2007).

[6] "The capacity to alter, modify, change, or override one's own emotions, thoughts, impulses or behavioural responses" (Baumeister and Heatherton, 1996). Ofter interchanged with terms like willpower or self-discipline (Mischel, 1996; Vohs, 2006).

Closely related to task-aversiveness is task structure. As less structured tasks are more difficult to coordinate one has to make many decisions. Hence there are more opportunities to give in to dilatory behaviour (Blunt & Pychyl, 2000). As people scoring high on conscientiousness tend to be more organised and have better coping skills, they are less likely to procrastinate on tasks. With a negative correlation of r= -.62 to trait procrastination, it is trait-procrastinations main correlate (van Eerde, 2002). When one is more dependent on his own planning skills, facets as unrealistic planning and task uncertainty can also contribute to procrastination. A person scoring high on self-efficacy is more likely to set realistic goals and to put more effort in successfully finishing the task (Bandura et al., 1989). Self-efficacy increases with age through learning (by first- and second-hand experience). 'Timing of rewards and punishments' can be explained by theories such as temporal discounting (Ainslie, 1975; Loewestein, 1992) (1.3). As such it can lead to an intention-action gap. Timing of reward and punishment is associated with impulsiveness, indicating spontaneity and a tendency to act upon desires of the moment. Impulsiveness and trait procrastination show a positive correlation of r=0.41 (van Eerde, 2002).

The main motivational factors are expressed in fear of failure. Closely related to conscientiousness, this trait characteristic revolves around situations in which one could fail, and result in state anxiety (van Eerde, 2002). In combination with low self-efficacy and self-esteem a real attempt at the task at hand, gives people little pride if they succeed, while risking a lot when failing (humiliation and shame) (Brown and Marshall, 2001). As such they may never really commit to a goal. With chronic procrastinators, this behaviour is often attributed to self-handicapping which involves placing obstacles that hinder one's own performance or finding external reasons in case they perform poorly (Ferrari and Tice, 2000). In relation to procrastination some experience negative fear of failure, while other may cite fear of failure as a reason for not procrastinating (Schouwenburg, 1992). This means, for the sample as a whole, procrastination and fear of failure appear unrelated.

2.2 Short-Term Mood Repairs

Emotion and motivation play an essential role in self-control and procrastination. Emotions help us devote greater attention to certain stimuli. From an evolutionary perspective emotions are a way of tagging important stimuli to ensure they receive the proper attention and response (Ward, 2012). Emotions can be related to stimuli that are rewarding (stimuli we want to attain) or punishing (stimuli we want to avoid). As such, many theories closely tie emotions to motivation. Motivation is defined

as states in which rewards are sought and punishments are avoided (Ward, 2012). Motivation makes a goal desirable, whereas an emotional state is elicited when a goal is (or is not) obtained. Even though emotional processing is mainly done automatically, it can be controlled in certain task or contexts (Ochsner et al., 2002). However, as will be discussed later, exerting such cognitive control can deplete self-control resources (2.3). Emotions differ from moods in that they are experienced as transient in nature whereas a mood is considered an emotional state extended over time (e.g. anxiety is a mood and fear is an emotion). Whereas emotions are linked to stimuli (they are object-based) and moods are not (Ward, 2012).

In self-regulation the individual tries to regulate processes by altering one's own responses (Tice & Bratslavsky, 2000). A special kind of self-regulation is emotional regulation. It differs from other kinds of self-control, in that it often undermines other self-control mechanisms; focusing on regulating moods and feeling states can lead to failure in exerting self-control by taking precedence over those mechanisms (i.e. time management or impulse control) (2000). Short-term mood repairs are a type of emotional regulation which focus on regulating a mood or feeling state on the short run, by behaviour that we would normally want to resist by asserting self-control (2000). As such, procrastination occurs when one delays on long-term goal pursuit in favor of short-term mood repairs.

Negative moods or feeling states (such as distress, anxiety, anger or sadness) predisposes people to fail at self-regulation. By focusing on controlling the bad mood, they often abandon other goals. Negative moods can be task-related or non-task related. Also, the act of exerting self-control itself can result in a negative mood. As such a negative spiral can be created around self-regulation (Sirois & Pychyl 2013). Take the example of someone who tries to follow a diet and has to resist a lot of his normal food consumption. The self-control necessary for refraining from eating whatever he wants leads to a bad mood. In order to feel better he now turns to junk food, thereby delaying his planned actions. The future self now carries the extra burden of having to deal with possible guilt, frustration, or negative associations; thus creating a bad mood in the next situation where one is tempted.

Different types of mood repairs can be attributed to procrastination, such as task disengagement, inaction inertia, counterfactual thoughts and giving in to pleasurable temptations (Sirois, 2004; Sirois & Psychyl, 2013). The ones most relevant to procrastination will be discussed. Task disengagement can be the result of an aversive, complex or chaotic task. When complex or chaotic, tasks can be experienced as more

difficult, which leads to the impression that chances at failing are high. In such cases task disengagement can be a defense mechanism. Inaction inertia describes how after having past on an opportunity to act on in intention in a timely manner, the lost opportunities result in negative feelings that can lead to further inaction in other tasks (Tykocinski & Pittman, 1998). Alternatively, after an initial delay, the awareness that one is no longer able to perform the action as well as in a situation where one had started sooner, can lead to total abandonment of the task. Both can lead to a cycle of doing nothing to protect one of negative feelings (Sirois, 2004). Giving into temptations also serves to regulate negative moods. People in negative moods tend to engage in greater subsequent self-gratification and self-reward than people in neutral moods, for instance by watching TV, eating junk food or doing excessive shopping (Fry, 1975**;** Tice & Bratslavsky 2000). As such, they prefer smaller immediate rewards to larger long-term rewards. Complementing a wide body of correlational, self-report, and observational studies, Tice & Bratslavsky (2000) induced negative moods that led to short-term gratification in a controlled lab setting: First, a negative mood was induced by telling participants in the sad condition (opposed to a neutral and a happy condition) a story in which the main character, being in a hurry, drives through a red light and causes an accident, resulting in the death of a child. Next, they were told they had to take an important test, and they were given 20 minutes to prepare. Aware of the fact that practicing would improve their result, sad participants exhibited less self-control, worked shorter and took more time procrastinating than the other participants did. Even in this seemingly artificially induced negative mood, mood repair took priority over other self-control goals, as sad participants chose to make themselves feel better at the expense of performing worse on an important task. By applying the mood-freezing method (Manucia, Baumann, and Cialdini, 1984), Tice & Bratslavsky (2000) further showed that in cases where participants thought that short-term mood repairs such as eating junk food could not change their mood, participants indulged less into short term mood repairs than participants in a sad mood who didn't receive the mood-freezing instructions. This shows that negative moods can be seen not only as correlating, but also as causing procrastination.

Considerations for implementation

The experiment conducted by Tice and Bratslavsky (2000) exemplifies the effectiveness of mood-manipulations. However, in individuals predisposition to guilt-proneness (e.g. make negative evaluations of specific bad behaviours), a negative mood can have the opposite effect. Guilt-proneness leads to thinking and acting ethically,

which results in compliance behaviour (Cohen et al., 2012). As a laboratory setting already induces feelings of being monitored, this could lead to the unwanted effect of compliance behaviour. From a timely and ethical notion, proposals for mood-manipulations have to be subjected to an ethical commission, as such costing more time and extra manpower during the experiment.

2.3 Self-Regulation and Ego-Depletion

Procrastination can also occur as a result of exhaustion of the self-control mechanisms in place to acquire the goals. Volitional acts such as controlling impulses, overriding habitual responses or making choices all depend on self-control (Hagger et al., 2010). Depletion of the requisite resource will hinder attempts at self-control that follow previous acts of self-control. (Baumeister et al., 2007; Bauer & Baumeister, 2011). Under the name 'the strength model of self-control', many agree on the idea that the exertion of self-control over dominant responses is a limited resource (Baumeister et al., 2007; Carter and McCullough 2014). When self-control is low and there is no time for rest and relaxation it causes short-term impairments (called ego-depletion) on subsequent (unrelated) tasks[7] (Baumeister et al., 2007; Tyler & Burns, 2008). As procrastination occurs more often when more self-control is required, procrastination can directly result from ego-depletion (Schraw et al., 2007).

In an experimental setting the dual task paradigm is often implemented to exhaust self-control mechanisms. Based on the view that human processing resources are limited and can be subdivided into several classes, some self-control task interfere with each other when performed simultaneously (Wickens, 1991). In such cases it is assumed that they both use the same information processing resource. Two tasks that don't interfere –and as such show the same performance score as in single task conditions- could be driving and singing a song. Singing a song while writing a paper however would result in a lesser performance on both or one of the tasks (Hagger et al., 2010). Depletion tasks have been tested within different domains such as controlling attention, controlling emotions, controlling impulses, controlling thoughts, cognitive processing, choice and volition, and social processing (Baumeister et al., 2007). Task characteristics that tend to be depleting involve an effortful suppression of an impulse or the overriding of a habitual or dominant response. Difficulty and complexity of a task

[7] This theory has been supported in the domain of eating, drinking, spending, sexuality, intelligent thought, making choices, and interpersonal behaviour (Baumeister et al., 2007).

has also been identified as requiring self-control, whereas task that lean heavy on learned knowledge do not (Hagger et al., 2010).

Considerations for implementation

Results from ego-depletion experiments employing the dual task paradigm are not unequivocal, and there are variations across the literature. Its inconsistency is suggested to be due to the presence of moderating factors such as features of the task used, or due to an inflation caused by small-study effects (Hagger et al., 2010; Carter and McCullough, 2014). In general it can be said that a longer duration of the depletion task in the dual-task paradigm, leads to a greater impairment on performance in the follow up task (2010). After a period of rest or focus on an unrelated task (especially when the task lifts up the mood) individuals' self-control resources can regenerate (Baumeister et al., 2007; Hagger et al., 2010). Especially a positive mood or emotion can counteract ego depletion. When for instance watching a comedy or receiving a surprise gift after a depletion task, participants perform significantly better than participants who receive a sad or neutral stimulus, or are allowed a brief rest period (Tice et al., 2005). In another experimental setting, participants were able to allocate resources in anticipation of another task. They showed lower levels of depletion in relation to a depleted control group (Baumeister et al., 2007). This fits the idea that people are motivated to retain a residual level of their self-control resources in anticipation of future need. As such it is preferred to give as little information as possible in regard to the length and amount of depletion tasks. Individual differences in depletion effect are expected: (a) it is hypothesized that exertion of self-control can be strengthened by learning; (b) some people are better at allocating self-regulatory resources among different tasks (Hagger et al., 2010), and; (c) depleted levels are generally higher at the end of the day (Baumeister et al., 2007). Despite these differences, all individuals are vulnerable to state depletion (2007). Tasks that show relatively stable depletion effects and are easy to implement as computer tasks involve the 'Cross out letters task' (switching between actions); 'Choose between products task' (focuses on constant choosing); and, the 'Stroop task' (requires inhibition) (Hagger et al., 2010).

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