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„The importance of backup plans on perceived importance to succeed“

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Thorsten van Hettinga, BSc

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Betreut von / Supervisor:	Univ.-Prof. Dr. Veronika Job Sutnar
Mitbetreut von / Co-Supervisor:	

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Introduction

Goal pursuit is essential for humans to engage in actions, whether it be to take a picture of a specific location, to score high on an upcoming exam, get a promotion, or even watch television, engagement is predicted by goals. Unfortunately, no matter how engaged one is, goal attainment is never completely certain, and thus humans have to develop means to manage uncertainty in goal pursuit. One such mean is the creation of *backup plans*. Backup plans are described as alternative means to an end (Napolitano & Freund, 2016). They are intentionally developed, set aside, and used if *Plan A* fails or following it is accompanied by major setbacks. Psychological research on *backup plans* is scarce (Napolitano & Freund, 2016). While there is a lot of research concerning how humans react to failure (Dweck & Leggett, 1988), only a few studies have looked at how *backup plans* are implemented following that failure (Napolitano & Freund, 2017). The aim of this study is to expand on the limited research currently available concerning *backup plans* by taking the work done by Napolitano and colleagues and integrating it with motivational intensity theory (MIT), which describes effort mobilization in goal pursuit (Brehm & Self, 1989; Wright & Brehm, 1989; Wright, 2008; Richter, 2013, 2016). In doing so my thesis will be able to create a more nuanced understanding of how *backup plans* affect goal pursuit.

Even though there is a general belief that *backup plans* are a helpful addition in goal pursuit (Napolitano & Freund, 2016, 2017; Shin, 2016), the knowledge derived from goal system theories and the concept of *equifinality* (Heider, 1958; Kruglanski, 2015) demonstrated that having a *backup plan* available can be detrimental to one's commitment and performance to their current plan. My thesis investigated the general idea that having a *backup plan* available to attain a certain goal can hinder path performance, either because of decreased commitment for *Plan A* and/or higher perceived instrumentality for the *backup plan*, which is the core idea as proposed by Napolitano and Freund (2017).

My thesis advances previous findings by illustrating how the drop in goal commitment can reduce effort mobilization on one's *Plan A* and how this reduced effort mobilization results in the poorer performance found previously. Hence, the main goal of my thesis is to illuminate many negative implications of creating and reserving *backup plans*.

While generating and reserving *backup plans* to manage uncertainty and reduce psychological discomfort during goal pursuit is a common and positive phenomenon for psychological well-being (Shin, 2016), if they also undermine task engagement on *Plan A*, they could be producing the psychological discomfort they are designed to protect against.

Theoretical Background

Equifinality. *Backup plans* symbolize alternative means to an end which draws from the concept of equifinality proposed by Heider (1958) and refined by Kruglanski (2002, 2015). While trying to attain a goal, people often consider multiple ways to ensure the goal is reached (Kruglanski, 2015). These ways are considered to be equifinal, meaning they all serve the same purpose. According to Kruglanski (2015), this raises the opportunity to substitute one means from the equifinality set for another but also poses the problem of choosing a specific mean from the set of available ones. Albeit the availability to choose between multiple means should reinforce the general confidence to attain a goal, having multiple means can also weaken one's commitment to a single mean, because as the number of means increases, the dependency on a single means decreases (Kruglanski, 2011).

Perceiving *Plan A* (or the first means to and end) as less useful and instrumental to attain a goal because of the availability of other possible means links the concept of equifinality to the research concerning *backup plan*s. Creating one or even multiple *backup plans* to ensure a goal is reached creates the equifinal structure and therefore provides a clear theoretical understanding for how *backup plans* can reduce path commitment. Important to note is that in my thesis we consider having a *backup plan* to be equivalent to adding another means for attainment of the same goal as proposed by the equifinal structure (see Figure 1). In other definitions, creating a *backup plan,* although being similar, is different from adding another means for the same end (Shin, 2016). The *backup plan*, therefore, can also be considered to be created for attainment of a new goal while still serving the same superordinate goal (e.g. if you fail to get a job at your desired company, you then try to get a job at a different company, although not fulfilling your Plan A, but ultimately reaching the superordinate goal of financial safety).

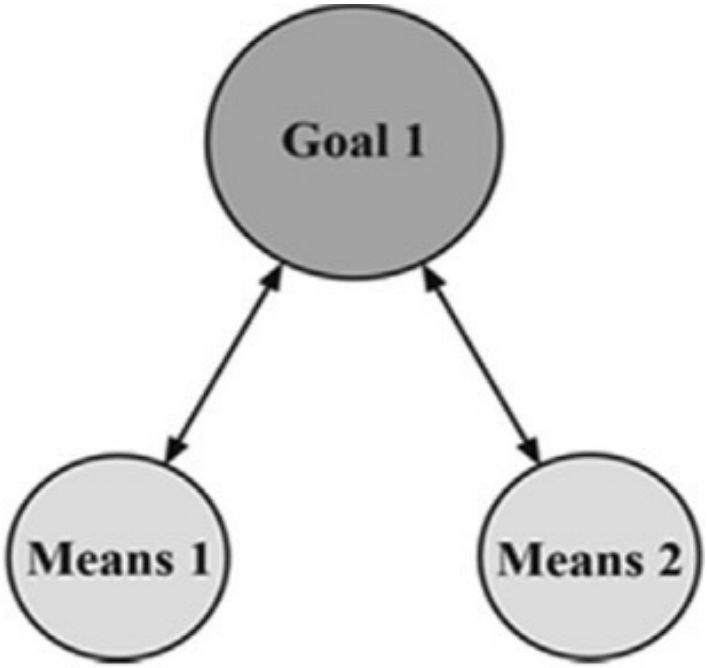

Figure 1. Equifinality set. Adapted from Kruglanski, 2015, page 71.

Backup plan research. Even though *backup plans* are a widely known concept and are used in everyday life, there is a lack of adequate literature concerning them (Napolitano & Freund, 2017). The majority of research concerning *backup plans* comes from Napolitano and Freund who published a theoretical discussion about *backup plans* in 2016 and followed this up with a set of studies concerning *backup plans* in 2017. In general, a *backup plan,* or sometimes called *Plan B* can be developed but remain unused if *Plan A* leads to the desired success. If following *Plan A* fails or one encounters major setbacks while doing so, the *backup plan* can be applied to increase the perceived probability of goal attainment.

Backup plans are categorized as *contingent* or *redundant* types. Both types are initially developed and reserved for future use. The major difference is that contingent *backup plans* are only implemented if a certain "contingency condition" is met (e.g. If you study law and your backup plan is to study medicine, the contingency condition to switch could be if you fail an exam 3 times). This makes *contingent backup plans* similar to *implementation intentions* (Gollwitzer, 1999). The other type, which my thesis will focus on, is the *redundant* type of *backup plans*. They are held in reserve, but are implemented at the users' discretion, meaning they lack a contingency condition (e.g. If you study law and medicine is your *backup plan*, you do not know when to switch, just that you could).

Although all *backup plans* are resource demanding (Napolitano & Freund, 2016), the *redundant* type is considered more so as the user has to constantly reevaluate when to implement the *redundant backup plan*. For a more detailed discussion, see Napolitano and Freund (2016).

Especially important for my thesis is the *backup paradox* research by Napolitano and Freund (2017). Conducting a total of five studies, Napolitano and Freund explored the question if developing a *backup plan* can facilitate the conditions that the backup plan was developed to potentially address: *goal attainment failure.* Their studies found support for the undermining effect of investing in a *backup plan.* The main finding, overall, was that the more people invested in a backup plan, the more likely they were to use it later on. According to Napolitano and Freund (2017), possible explanations for this paradox are the higher perceived instrumentality of the *backup plan* and/or a resulting lesser motivation to keep following *Plan A*, which is linked to the *sunk cost fallacy* (Garland & Newport, 1991). Napolitano and Freund (2017) further suggested that the paradox might be most prominent if resources are restricted, and more time is spent on the development of the backup plan. Also, during goal pursuit, the more people replaced *Plan A*, the more their actual performance on a task suffered.

My thesis was designed to replicate and extend the main findings concerning the detrimental effects of *backup plans* by Napolitano and Freund (2017). It will aim to replicate the findings by showing how having a *backup plan* can be detrimental to *Plan A* performance, and it will extend it in two major ways. It will aim to illustrate that *backup plans* can reduce *Plan A* performance without influencing (1) resource availability or (2) disengagement processes. Looking at the five studies conducted by Napolitano and Freund, participants were always given the instruction, at least to a certain degree, to invest into a *backup plan* by constructing and/or refining it before the actual task, therefore the mere creation of the *backup plan* was resource demanding. Furthermore, the studies by Napolitano and Freund asked participants to choose when they wanted to disengage from *Plan A* to implement their *backup plan*. The study for my thesis instead instructed participants when they would complete their *Plan A* and implement their *backup plans* removing disengagement processes from the phenomenon. To generate a more direct measurement of one´s commitment to stick to a mean, my thesis adds cardiovascular measures for effort mobilization, applying the predictions from motivational intensity theory (Brehm & Self, 1989) for tasks of unknown difficulty.

Motivational intensity theory. Motivational intensity theory (MIT) serves as the theoretical foundation for this study. MIT is built off of the energy conservation principle (Brehm & Self, 1989; Richter, 2013, Wright, 2008). This principle constitutes, that individuals strive to avoid wasting energy when trying to attain a goal or execute a behavior. In order to determine the necessary energy required to successfully execute a behavior, individuals use difficulty as the main indicator (Brehm & Self, 1989; Wright, 2008; Richter, 2013). Thus, the more difficult one perceives a task or behavior to be, the more energy they will perceive as necessary to complete it. However, to ensure that the required energy necessary for task success is not wasted, either because task success is impossible, or the expected benefits are not perceived as justified by the effort, MIT predicts two major limitations for the difficulty – energy relationship (Richter, 2013):

- Energy investment ought to be a direct function of task difficulty if success at the task is possible.
- Energy investment ought to be a direct function of task difficulty if the necessary energy is justified by success importance.

Deriving from this, if the task is perceived as impossible or not worthwhile given success importance, no further energy will be invested (Figure 2).

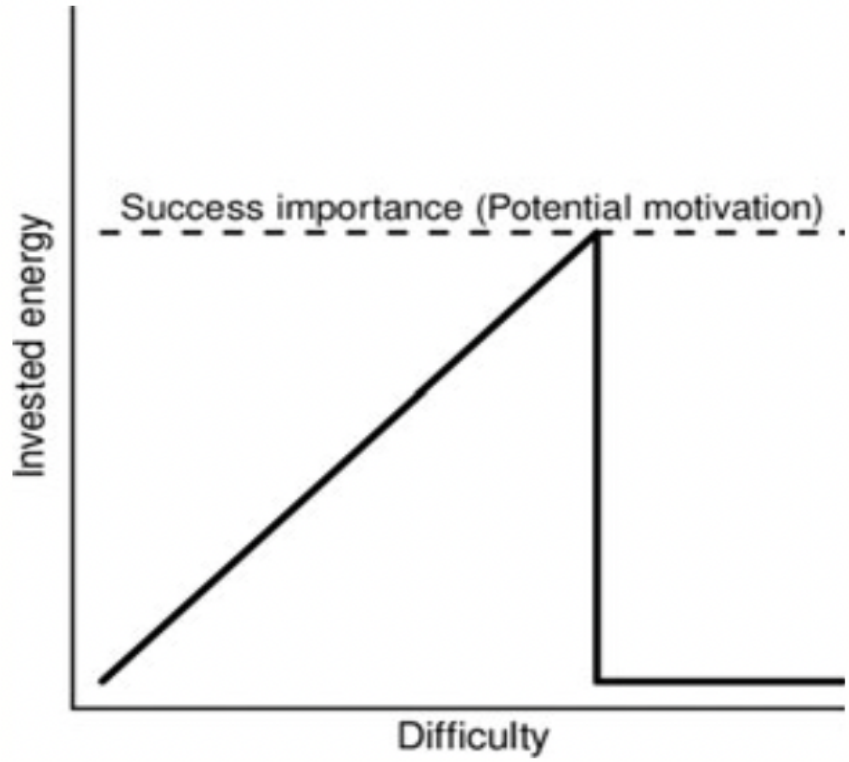

Figure 2. MITs predictions for tasks with known difficulty. Adapted from Richter, 2013, page 3.

The two predictions however consider energy investment under conditions of known difficulty. Since my thesis applied tasks where difficulty was not made clear to participants, another major prediction from MIT will be considered: if perceived task difficulty cannot be applied to adjust the level of necessary energy, success importance will serve as the indicator (Brehm & Self, 1989; Richter, 2013; Wright, 2008). Although success importance does not indicate how much energy is necessary for success (Richter, 2013), it ensures that the necessary cost does not exceed the potential benefits. Therefore, individuals may invest more effort than necessary, but never more than justified, making invested energy a direct function of success importance under conditions of unknown difficulty (Figure 3).

Figure 3. MIT´s predictions for tasks under unknown difficulty. Adapted from Richter, 2013, page 4.

Considering this prediction, individuals should strive for the highest possible performance that is justified by success importance (their potential motivation to be successful) and should select the highest difficulty level where the cost does not outmatch the potential outcome (Brehm & Self, 1989). According to Gendolla and Richter (2005) even in situations where choosing the difficulty level is not possible and the instruction for the task follows the "do your best" approach, individuals will still strive for their best possible performance to assure goal attainment.

Effort mobilization and cardiovascular response. Drawing from the original work by Obrist (1981), who demonstrated that the sympathetic nervous system responded when individuals engaged actively in tasks where their performance directly influenced the outcome (in his words "active coping"), Wright (1996, 1998) proposed that increased sympathetic myocardial activity in active coping tasks reflects effort mobilization. Wright, therefore, suggested that MIT can be applied to predict myocardial sympathetic activity.

Since then, an abundance of studies have followed Wrights (1996) approach by manipulating parameters of active coping tasks while measuring myocardial sympathetic activity as the indicator for effort mobilization (see Gendolla & Richter, 2005, 2009; Gendolla, 2006; Gendolla et al., 2016; Gendolla & Wright, 2005; Richter, 2008; Richter et al., 2012; Wright & Kirby, 2001). My thesis follows these footsteps but focuses on active coping tasks of unknown difficulty and effort mobilization, which generates interesting insights into MITs predictions since overall, more studies have been conducted surrounding tasks of known difficulty (see Richter, 2012 & 2016).

Considering that effort mobilization is reflected in sympathetic activity on the heart and vascular system, adequate cardiovascular measurements have to be applied. The majority of studies concerning MIT have used measures that reflect the force of myocardial contraction in the vasculature (Richter, 2016). These measures are systolic blood pressure (SBP) – the maximum force the heart exerts on the arteries between two heartbeats, diastolic blood pressure (DBP) – the minimum force on the arteries between two heartbeats – and heart rate (HR) – the amount of heartbeats in a given timespan, usually a minute (Richter, 2016).

More recent studies have relied on pre-ejection period (PEP) as a more reliable measure of myocardial contraction as it is measured directly on the heart as opposed to the vasculature (Richter, 2016). PEP represents the time between the initial ventricular depolarization and the opening of the aortic valve. According to Richter (2016), PEP serves as the most reliable, noninvasive indicator of sympathetic impact on the heart presently available, since it is a direct indicator of changes in the force of myocardial contraction (Newlin & Levenson, 1979; Sherwood et al., 1990) and depends less on parasympathetic impact or peripheral resistance than conventional measures like blood pressure. For more details and limitations of cardiovascular measurements, see Richter (2016).

Hypotheses. Building off of Napolitano and Freund´s work (2016, 2017), this study investigates if the mere availability of a *backup plan* hinders one's effort mobilization and thus performance on a task of unknown difficulty. Having a *backup plan* available can lead to lower perceived importance of success, because of the diluting effect of having multiple means to an end (Kruglanski, 2015) and therefore leads to lower motivation for *Plan A*. In accordance with MIT, this reduced importance should be illustrated as less effort mobilization on a task of unknown difficulty. The *backup plan* can also be perceived as being more instrumental for success, lowering motivation for *Plan A*. This reduced effort mobilization leads to decreased performance on a task which can be seen in the previous

work by Napolitano and Freund (2017). Therefore, my thesis solidifies the main findings by Napolitano and Freund and advances the *backup plan* research by introducing MIT, bringing a level of nuance, and understanding the precise mechanisms at the core of the phenomenon.

The proposed main hypotheses derived from this and central for this research are:

H1: Participants with a backup plan available show lower effort-related CV response.
H2: Participants with a backup plan available report lower commitment for Plan A.
H3: Participants without a backup plan available show a higher level of performance.

Main expected results are illustrated in Figure 4.

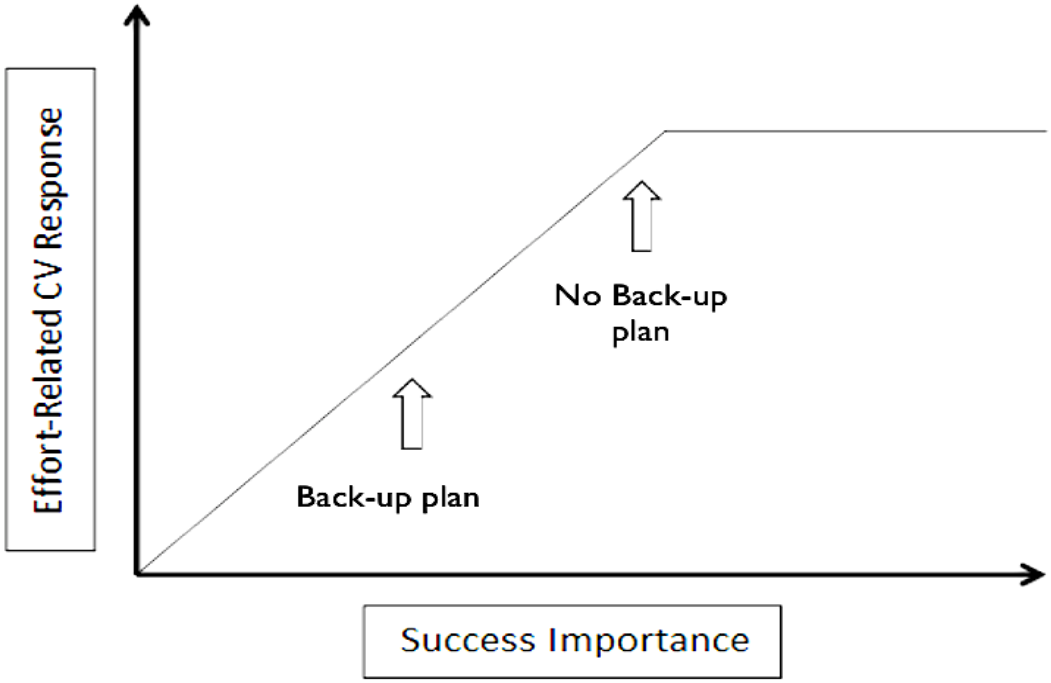

Figure 4. Main expected results for the hypotheses.

Exploration and ego involvement. My thesis also investigates possible moderator effects concerning *backup plans* as proposed by Napolitano and Freund (2017) and as seen in Figure 5. The first being the personality trait conscientiousness because according to Napolitano and Freund (2017), people who are more conscientious are more likely to manage the extra cost of backup plans. Therefore, having a *backup plan* available, which, according

to our prediction, can be detrimental to one`s performance, is moderated by conscientiousness to some degree.

The second exploration focuses on pessimism because people who are more pessimistic are more likely to disengage from goal attainment after setbacks to protect their self-esteem (Napolitano & Freund, 2017; Norem & Cantor, 1986).

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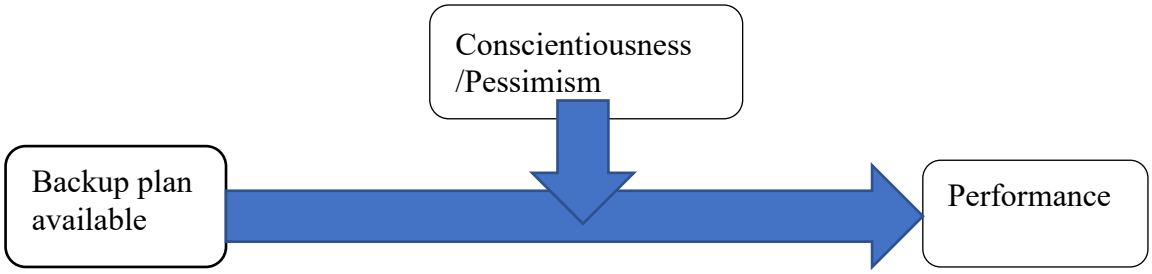

Figure 5. Suggested exploration of possible moderation effects of conscientiousness and pessimism on performance while having a backup plan available.

Method

Participants. Initially drawing from the work by Napolitano and Freund (2017), who conducted studies with the same experimental conditions as this study – the difference between two independent means (having a backup plan vs. not having one), there already existed an a priori knowledge of effect size: d = 0.5312185. Making use of this a priori knowledge we conducted a power analysis using G-Power (G-Power; Faul, Erdfelder, Buchner, & Lang, 2009) aiming for a power of .80, an alpha of 0.20 and utilizing an effect size of d = .5 the indicated sample size was 62 participants for each respective group. Hence, this study originally aimed for a total sample size of 124 participants. To recruit the participants, this study used the University of Vienna LABS recruitment system since the research was conducted in the context of the master's program of psychology. The recruitment system sent out emails to all registered and possible members, which created a sample of mostly students enrolled at the University of Vienna with the majority being female. Participants were compensated with credits which was mandatory to earn to

successfully finish a seminar in their program. The final sample size of the study was 74 participants (78 before dropouts post data analysis), 60 female, 12 male and 2 participants who chose to not disclose information. The sample was relatively young (M = 21.592, SD = 4.415).

Procedure. The study was conducted in the Motivational Sciences Lab of the University of Vienna. Upon arrival, participants were given information about the study and had to fill out a data consent form. Following that, a 10-minute relaxing phase was initiated where participants could listen to music of their choice on Youtube. This ensured a valid baseline measure for HR, SBP, DBP and PEP. The baseline measure was conducted during the last 2 minutes of the 10-minute relaxing phase for every 15 seconds that passed.

Participants then received instructions for the main task. The main task consisted of a clicking task using either the left or right arrow key and participants were instructed that, to be successful on the task, they had to click a certain number of times in a predetermined timeframe. The exact amount of clicks was not known to them, making this task a task of unknown difficulty. Clicking tasks have been applied in past research that linked effort directly to cardiovascular response (Mlynski & Wright, 2017; Mlynski et al., 2020).

After the instruction they were given the opportunity to practice both versions of the task, clicking the left and right arrow key. Following the practice phase, participants in both groups were told that they should now choose one of the just practiced clicking tasks for the main task and would have to complete the not chosen task after completing their initially chosen task. In order to manipulate the availability of a *backup plan* we informed half the participants that only their best performance on either of the two tasks would be graded, thus creating an availability *backup plan* in the form of the not chosen task. The other participants were informed that both tasks were graded together, thus not providing them a backup plan. Each task consisted of a total of 24 sounds which signaled the participants to click as many times as they could during the sound. For each round, effort-related CV data was recorded.

Random assignment of the participants to one of the two conditions of the experiment was conducted via a coin toss using the computer before starting the main task, ultimately resulting in 38 participants for the no backup-plan group and 34 for backup plan. CV measurements were taken during the entirety of the clicking task.

To ensure that success importance was high in a study without a direct incentive, this thesis applied the concept of *ego involvement*. This has been done by Gendolla and Richter (2005), as they describe ego involvement as a "variable that refers to self-esteem related implications of task performance" (Gendolla & Richter, 2005, page 595). This ensured

success is of high importance in our tasks because an individual's self-esteem is at risk. In my thesis, we applied this concept by informing the participants before the main task that their performance is directly linked to their academic and professional success in the future.

Before and after the main tasks, participants were asked to fill out self-report items for importance of succeeding on the current task, commitment to their chosen task, and their perceived ability on the current task. Post-task questionnaires for demographic data as well as conscientiousness and pessimism were used. After completing the main task and filling out the final questionnaires, the experimenter debriefed the participants and reviewed the results with each one. While participants without a *backup plan* were shown results from both versions of the task, participants in the backup plan group were only shown the results of one version.

Measures. *Cardiovascular measures.* This study noninvasively measured impedance cardiogram (ICG) and electrocardiogram (ECG) signals with a Cardioscreen 1000 system (medis, Ilmenau, Germany) to assess heart rate (HR) and PEP. B-point location was estimated based on the RZ interval of valid heartbeat cycles. PEP (in milliseconds) was determined as the interval between R-onset and B-Point (Brownley, Hurwitz, & Schneiderman, 2000; Kelsey, 2012). This is generally accepted as the gold standard for measuring beta-adrenergic activation due to the lack of influence from changes in parasympathetic activity or vascular resistance, as is the case in other common beta-adrenergic activation measures. HR was determined on the basis of IBIs assessed with the Cardioscreen system. SBP, DBP, mean arterial pressure (MAP), and HR was oscillometrically assessed with a Dinamap Carescape V100 monitor (GE Healthcare, Milwaukee, WI).

Questionnaires. To get self-reported data for success importance, commitment to task, and perceived ability on the task, single items with a 5-point Likert scale were used. Success importance was asked with "How important does task success appear to you?", commitment to task with "How committed would you describe yourself to the task?" and perceived ability with "How would you describe your overall ability on the task?". While success importance and commitment to the tasks are of direct interest for the study, the perceived ability ensured that participants who felt to be highly skilled in clicking tasks (e.g., because they play a lot of video games) got noticed.

For conscientiousness, the German version of the items for conscientiousness (a total of 12 items) from the Big Five Inventory – 2 (BFI-2) was used (Danner et al., 2019). The BFI – 2 uses a 5-point Likert scale. To get explorable data for pessimism, the Life Orientation

Test (LOT – R), which is highly established to measure the optimism-pessimism dimension was used (12 items) (Glaesmer et al., 2008). The LOT – R uses a 5-point Likert scale as well, meaning that all items used in this study used a 5-point scale.

Dropouts. Following the data analysis, a total of four (4) participants had to be excluded from the data. Two of those participants reported at the debriefing that they did not understand the instruction which led to the assumption that they could not be manipulated. Another participant had to restart the main task due to technical issues during the task and one reported to not engage in either task as they perceived they would ultimately fail before starting.

Data analysis. The point biserial model allowed t-test to be applied to get the main differences between the two independent groups. Before commencing the main analysis, we averaged each of the cardiovascular data (HR, PEP, SBP, DBP, MAP) across all experiment phases (baseline, clicking task 1, clicking task 2) making it possible to create change scores (Δ) as a valid measurement for the change in effort put forth (Llabre et al., 1991). Change scores were created by subtracting the average cardiovascular data of the clicking tasks from the baseline data. Furthermore, to check for possible measurement errors during data collection, we split the cardiovascular data according to the respective group, ultimately resulting in the exclusion of seven (7) single data points (>3 *SD*, as 99% of data should be inside this range).

As for the main analysis, we focused on the differences in change scores for PEP and SBP, as we did not have an a priori prediction for HR and DBP in relationship to the hypotheses. We analyzed them, but only for exploratory reasons. Furthermore, data analysis centered around the difference between baseline and the chosen version of the clicking task, as our hypothesized difference was concerning the amount of effort and performance on the chosen task (i.e. Plan A). IBM SPSS was used to for data analysis and for exploration of moderation effects, Process Macro was loaded into SPSS.

Results

Effort-related CV response. Baseline data for cardiovascular measures can be found in Table 1 and data for cardiovascular change scores (Δ) between baseline and clicking task 1 in Table 2. Results for the main analysis of CV Δ Scores (SBP, PEP) using Levene's test for equality of variance did not yield significant results for SBP or PEP Δ scores ($p > .320$) so

equal variance was assumed in both analyses. Results indicated no significant difference between the two groups for SBP ($t(71) = 1.67$, $p = .100$, $d = .39326$) and PEP ($t(70) = -1.64$, $p = .105$, $d = .389$). While not significantly different, the predicted effect was in the correct direction (Figures 6 and 7) with the backup plan group putting forth more effort (PEP: $M = 115.83$, $SD = 14.33$; SBP: $M = 114.63$, $SD = 10.86$).

Table 1

Baseline data for cardiovascular measures

	No backup plan	Backup plan
PEP		
M	127.38	125.18
SD	13.47	11.99
SBP		
M	110.60	108.64
SD	8.00	8.70
DBP		
M	64	64.27
SD	5	6.78
HR		
M	85.63	80.35
SD	12.58	12.078
MAP		
M	81.14	80.62
SD	5.44	6.78

Note. Abbreviations: PEP, pre-ejection period; SBP, systolic blood pressure; DBP, diastolic blood pressure; HR, heart rate; MAP, mean arterial pressure; M, mean; SD, standard deviation.

Table 2

Change scores data for cardiovascular measures

	No backup plan	Backup plan
Δ PEP		
M	-11.43	-8.41
SD	8.33	7.08
Δ SBP		
M	8.09	5.37
SD	7.90	5.65
Δ DBP		
M	1.57	2.24
SD	4.601	5.36
Δ HR		
M	3.95	4.88
SD	7.24	5.36
Δ MAP		
M	4.55	3.85
SD	4.94	5.71

Note. Abbreviations: Δ PEP, change-score pre-ejection period; Δ SBP, change-score systolic blood pressure; Δ DBP, change-score diastolic blood pressure; Δ HR, change scare heart rate; Δ MAP, change-score mean arterial pressure; M, mean; SD, standard deviation.

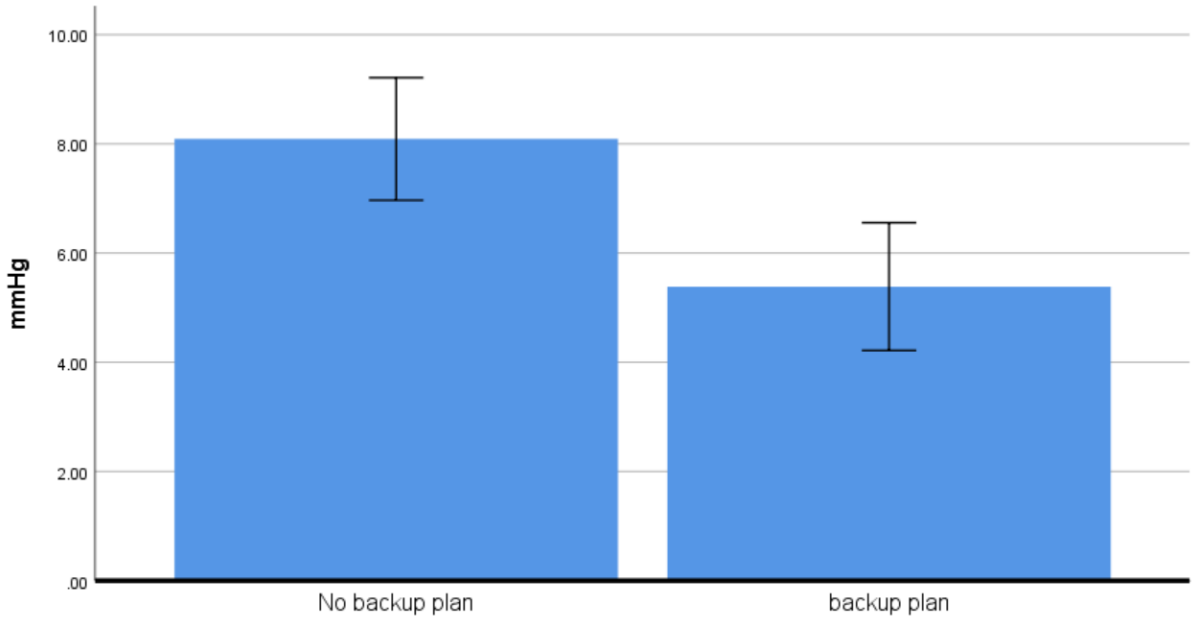

Figure 6. Change in cardiovascular data scores for SBP compared between baseline mean data and mean data for clicking task 1. Based on estimated marginal means for Δ systolic blood pressure. Abbreviation: mmHg, millimeters of mercury.

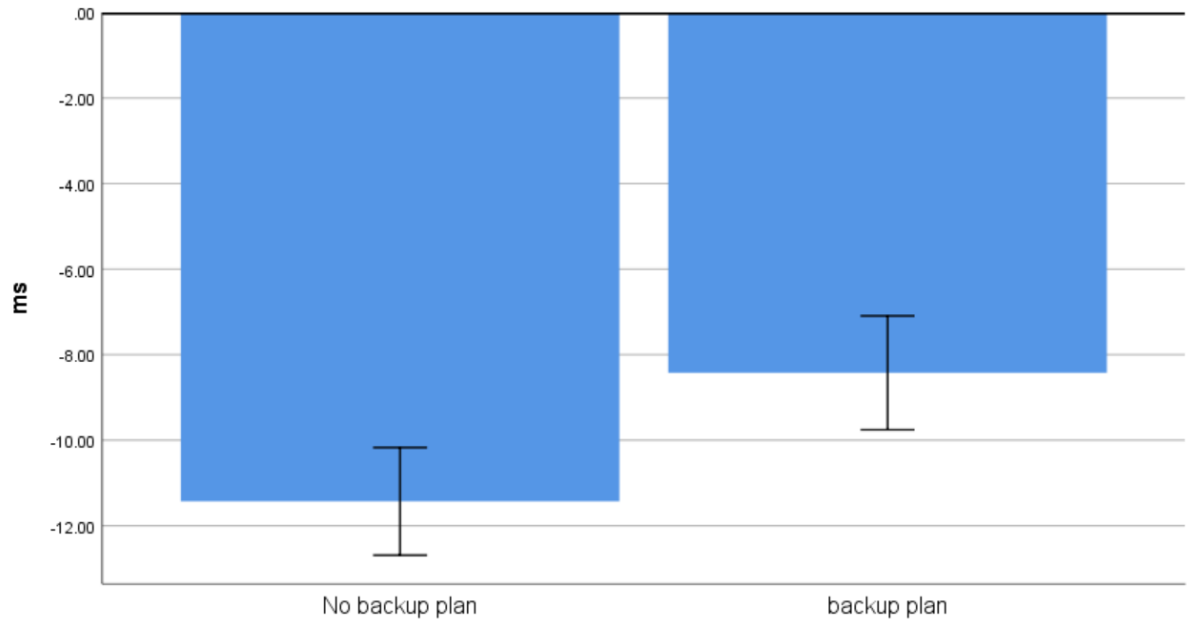

Figure 7. Change in cardiovascular data scores for PEP compared between baseline mean data and mean data for clicking task 1. Based on estimated marginal means for Δ pre-ejection period. Abbreviation: ms, milliseconds.

Commitment. Analysis of the questionnaire data yielded an overall high commitment on the 5-point scale for the 38 participants in the no backup plan group (M = 4.08, SD = .587) as well as for the group with a backup plan available (M = 3.97, SD = .774; in total: M = 4.03, SD = .682). Testing for the between-subjects effect using univariate ANCOVA in reported commitment as predicted by hypothesis 2, no significant results could be found ($F(1,73) = .449$, $p = .505$) but estimated marginal means slightly indicated the direction of effect as suggested by our study (Figure 8).

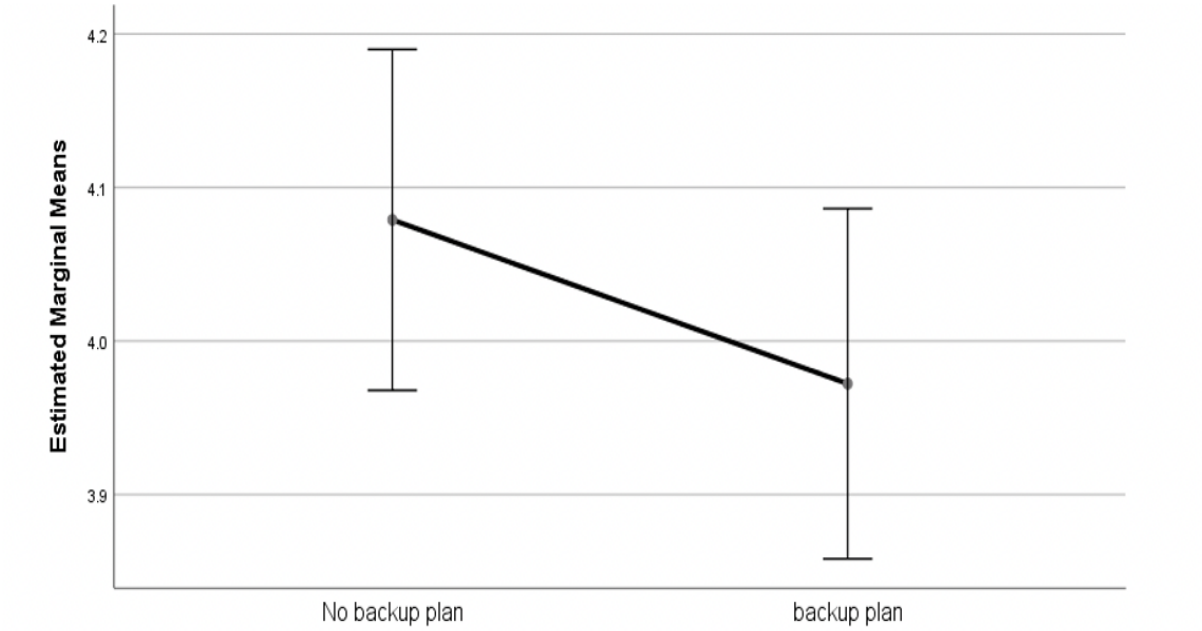

Figure 8. Differences in self-reported commitment between backup plan and no backup plan group.

Performance. Performance was indicated by the number of clicks during the main task, either using the right or left arrow key. Independent samples test for comparing performance between backup plan group and the no backup plan group did not produce significant results ($t(72) = .616$, $p = .540$). While the best performing participants were part of the no backup plan group, overall differences in clicking performance were very little (Figure 9). Estimated marginal means yet again yielded some insights, indicating a better performance in the direction towards participants without the backup plan available for the main task.

Ensuring that a higher effort measured via cardiovascular data acted as a valid predictor of effort put forth in our experiment, we used Pearson correlation to check. For both of our main SBP and PEP Δ scores, clicking performance correlated significantly, $r(73) = .435$ ($p < .001$) for SBP and performance and $r(72) = -.390$ ($p < .001$) for PEP and performance.

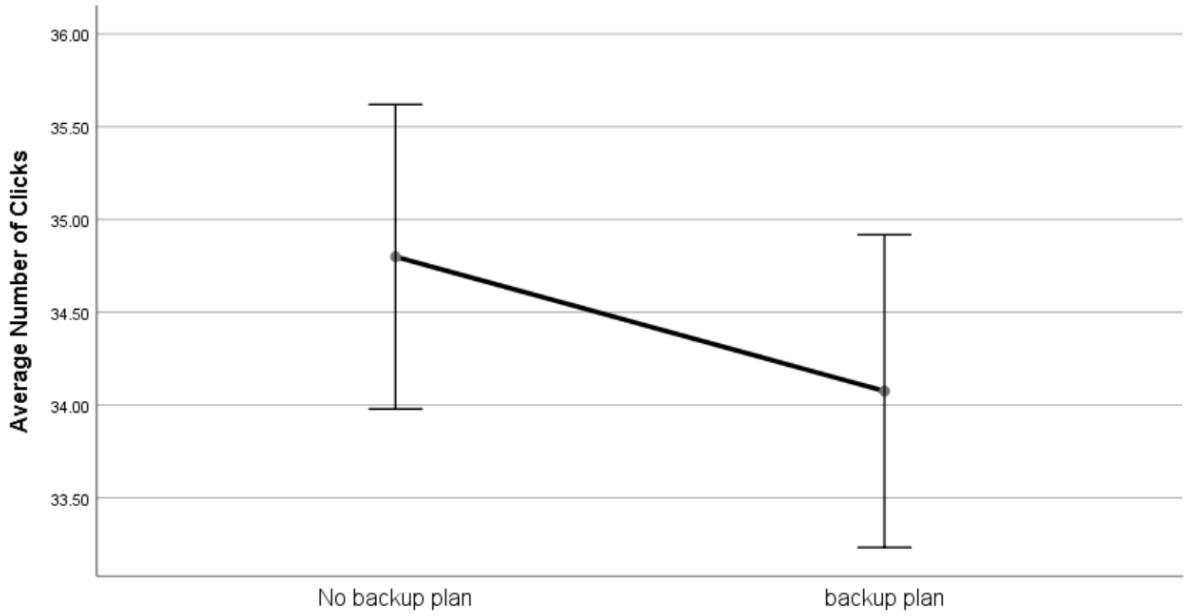

Figure 9. Differences in clicks between backup plan and no backup plan group. Average number of clicks is defined as average number of clicks during each of the 24 sounds during the clicking task.

Exploration for conscientiousness and pessimism. A moderation analysis according to Hayes (2017) was run to determine whether the interaction between having a *backup plan* available and being more conscientious or pessimistic significantly predicts performance on the given task. While no significant effect was found for conscientiousness ($p > .05$), the model significantly predicted an effect for individuals high in pessimism ($p = .0473$), leading to the indication that individuals high in this trait while having a *backup plan* available are driving the effect of reduced performance (Figure 10). When pessimism was low, no effect has been found. Comparing between groups for the optimism – pessimism continuum, no significant difference between backup plan group and no backup plan was found ($F(1, 69) = 3.919$, $p = .052$).

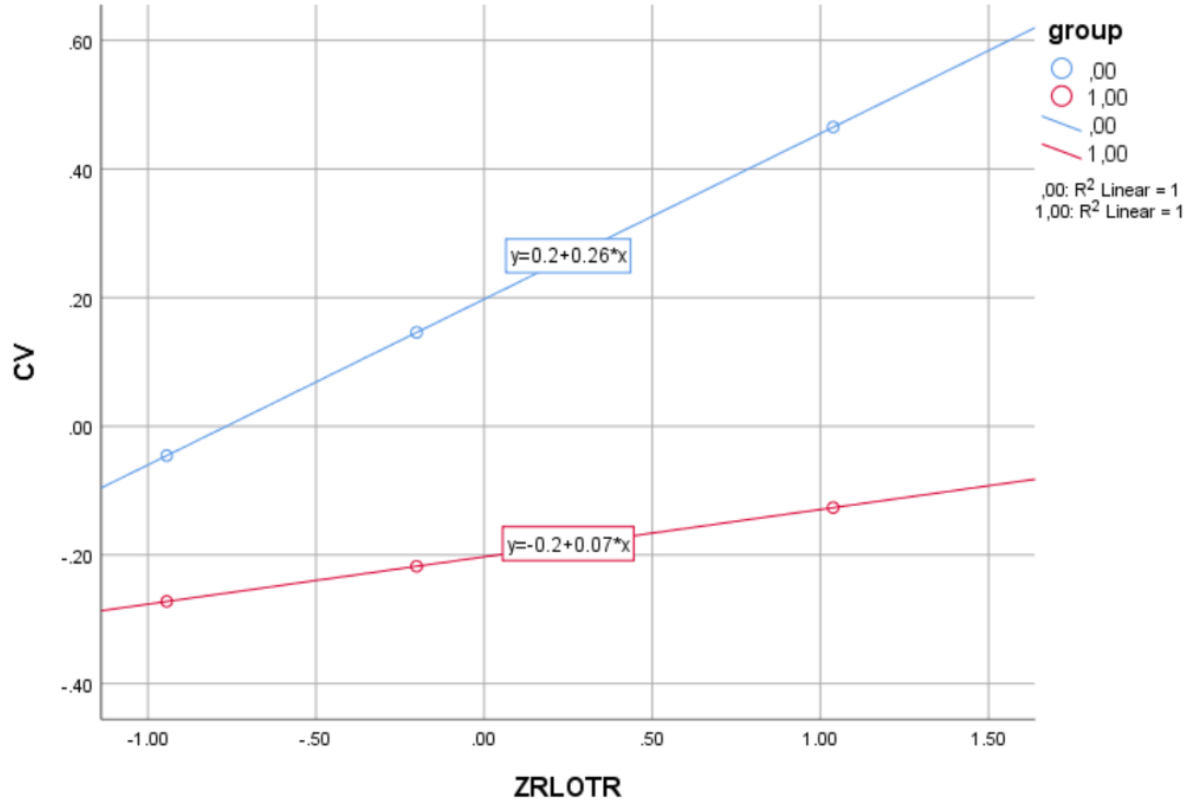

Figure 10. Scatterplot for analysis of moderation: individuals high in pessimism (lower) vs individuals low in pessimism (upper) in the backup plan group. CV data is based on change scores for PEP.

Discussion

Main findings. Hypothesis 1 assumed that participants with a *backup plan* available will put forth less effort which is reflected in cardiovascular data. Findings for cardiovascular data did not indicate a statistically significant group difference leading to a rejection of H1, but results for PEP and SBP indicated the correct direction of effect as predicted by our hypothesis and an effect size which indicated a meaningful effect. In accordance with studies in the past two decades that applied Wrights (1996) refinements of Obrist´s (1981) predictions of effort under active coping tasks, my thesis focused on the application of SBP and PEP to reflect the force of myocardial contraction as main predictors for effort leading to task success. Even though we assessed values for HR, DBP and MAP as well, we did not make these values part of our main prediction and had no a priori assessment since they reflect a poor indicator for myocardial sympathetic activity in comparison to SBP and PEP

(Richter, 2016). The main results for cardiovascular data, although not being significant, are important for several reasons.

First of all, the detected direction of effect in our data reflects a direct conformation for measuring cardiovascular data as an indicator for the sympathetic impact on the heart and therefore the effort put forth on an active task and yet again adds to the already vast literature that connects those two and expands its assumptions into the *backup plan* literature. Secondly, the majority of research using a similar approach has focused mainly on the predictions of motivational intensity theory for tasks of known difficulty (Richter, 2016), whereas my thesis employs its predictions and expands the CV - effort relationship research for tasks of unknown difficulty. Lastly and most importantly, this study is a novelty in the field of *backup plan* research since it adds the cardiovascular measurement for effort put forth on a task of unknown difficulty and demonstrates that psychological, experimental research in this direction using this approach can bear fruits.

While the results for SBP and PEP for the backup plan group in comparison to the group without a *backup plan* for the task create the expectation that the suggested hypotheses can be confirmed in a possible follow up experiment, it is important to note that cardiovascular data cannot be used to reflect emotional or motivational states of the participant (Kreibig, 2010; Wright & Gendolla, 2012) and even though we did measure perceived importance to be successful (commitment) at the task and applied ego involvement, motivational statements linked to *backup plans* are limited.

Hypothesis 2 suggested that having a *backup plan* available will lead to lower commitment for success at the task. Even though lacking significant results and therefore failing confirmation, a meaningful effect like for hypothesis 1 was indicated. As for hypothesis 3 of my thesis, which assumed a higher performance demonstrated by participants without a *backup plan*, neither significant results nor meaningful effect could be found, leading to rejection of H3.

Main interpretations for the results concerning commitment and performance for *backup plans* vary from the ones suggested by Napolitano and Freund (2017) due to the nature of our experiment. While it is safe to assume that the effect as proposed by the dilution model, lowering commitment for every possible means to an end for every additional means (Kruglanski et al., 2011), plays a major role, we cannot assume that the case unique for *backup plans* – prior investment being the key player for lowering commitment – drives the effect. Contrary to the study by Napolitano and Freund (2017), participants did not have the opportunity to develop and therefore invest resources into the *backup plan*. They were simply

informed about its availability and possible future use to still be successful at the given task. Therefore, we cannot assume that participants perceived the *backup plan* as more instrumental. Another key difference is that our *backup plan* did not act as a possible substitute for *Plan A* during the task and more like a second chance if participants felt like they could not reach the necessary number of clicks during the first round of clicking. However, effect size indicating a difference in commitment when there is a *backup plan* existent in comparison when not is an exciting result which can lead to future research in the field surrounding *backup plan*s.

Results for performance could not indicate a significant difference between the two groups, which might be due to the relatively simple nature of the task, the clicking of a button in a given timeframe.

Exploration. My thesis aimed to expand on the scarcely existing literature on *backup plans* and enlarging it by adding motivational intensity theory's prediction about tasks of unknown difficulty and linking it to cardiovascular data. We also explored for the possible proposed interindividual differences concerning effects of *backup plans* by Napolitano and Freund (2017), conscientiousness and pessimism. Analysis of moderation yielded no results for the personality trait of conscientiousness, which is not that surprising since individuals scoring higher in this trait are said to be better at regulating the initial developing costs of *backup plans* (Roberts et al., 2009) and our experiment did not include an actual developing phase. Exploring for possible effects of this trait was still an interesting approach and future research which includes a development phase could potentially lead to significant findings. Analysis of pessimism as a possible moderator for the suggested relationship did also not indicate an effect for the group without a *backup plan*, however it seems like individuals scoring high in this trait are main drivers of the effect lowering performance when a *backup plan* is available, which could signify an earlier disengagement to protect self-esteem at the cost of decreased performance (Norem & Cantor, 1986). If a follow up study can confirm that being more pessimistic has a moderating effect on the backup plan – performance relationship, these insights could lead to interesting revelations on how individuals scoring higher in this trait could potentially design their overall approach for general goal attainment.

Limitations. We assume that the limited sample size caused the experiment to not result in any significant findings and the homogenous structure does not allow to generalize any of the findings nor make assumptions about its general application. This research is the first of its kind to empirically link the *backup plan* research with MIT and cardiovascular measurement for effort, hence a priori orientation was restricted. Based on this, all

interpretations are largely grounded in past literature and effect size. Thus, we are not able to draw any solid conclusions for the effect of *backup plans* as suggested by our hypotheses yet. Furthermore, real life application of the research for improved self-regulation is limited since *a backup plan* or a *Plan B* is generally developed by the individual (Napolitano & Freund, 2016) before embarking on the journey to attain a goal and is not simply available from the beginning.

Despite the limitations, future research can adopt the methodology of our experiment since overall, it worked smoothly and due to limited resources and sample size this research can be seen as a pilot study in this field. Following the suggestions by Napolitano and Freund (2017), we think that adding to the sample size and applying realistic goals to extend the external validity would create a fertile base for the exploration of the potentially negative effects as implied by the *backup plan paradox.*

Conclusion. In conclusion, my thesis creates a foundation for future research in the field of *backup plans* and extends the literature. Even though no significant results could be found, first indications lead to the assumption that a follow up study with a larger sample size might be able to do so. Albeit we adapt the assumption that *backup plans* can be harmful, we do not follow the approach that one should avoid creating them in the first place. *Backup plans* can most definitely not only assure a certain type of goal attainment and bolster the confidence to be successful, but they can also be a useful investment in the first place and a nice thing to have since no matter your ability and preparation, life can take some unexpected turns. Interesting for the future of *backup plan* research is to explore the very conditions under which the creation of a *Plan B* becomes beneficial or maladaptive and if interindividual differences have an influence.

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Appendix

Abstract

In this study we tested if the mere availability of a *backup plan* while trying to be successful on a task has negative effects on one`s effort put forth and the commitment to be successful, therefore leading to decreased performance. Difficulty of the task (reaching a certain number of clicks in a certain timeframe) was unknown to participants and effort was measured via cardiovascular reactivity. We randomly assigned a total of 74 participants into two independent groups (backup plan vs. no backup plan) and compared change scores on pre-ejection period (PEP) and systolic blood pressure (SBP) as well as self-reported questionnaire data. Participants used the left and right arrow key for the clicking task. While main results could not significantly confirm our hypotheses, we did find a meaningful effect for effort put forth and commitment. We also explored for possible moderating effects of conscientiousness and pessimism on the relationship between *backup plans* and performance. This study is a first of its kind, combining predictions of motivational intensity theory for tasks of unknown difficulty with the *backup plan* research and cardiovascular reactivity under effort mobilization.

Keywords: motivation, self-regulation, backup plan, unknown task difficulty, cardiovascular reactivity

Abstract (german)

In dieser Studie untersuchten wir, ob die bloße Verfügbarkeit eines *Backup Plans* während des Versuchs, bei einer Aufgabe erfolgreich zu sein, negative Auswirkungen auf die eigene Anstrengung und das Engagement, erfolgreich zu sein, hat und somit zu einer geringeren Leistung führt. Der Schwierigkeitsgrad der Aufgabe (Erreichen einer bestimmten Anzahl von Klicks in einem bestimmten Zeitrahmen) war den Teilnehmer*innen nicht bekannt, und die Anstrengung wurde über die kardiovaskuläre Reaktivität gemessen.
Wir teilten insgesamt 74 Teilnehmer*innen nach dem Zufallsprinzip in zwei unabhängige Gruppen ein *(*Backup Plan vs. kein Backup Plan*)* und verglichen die Veränderungswerte für die Präejektionsperiode (PEP) und den systolischen Blutdruck (SBP) sowie die Fragebogendaten. Die Teilnehmer*innen benutzten die linke und rechte Pfeiltaste für die Klickaufgabe. Während die Hauptergebnisse unsere Hypothesen nicht signifikant bestätigen

konnten, fanden wir einen bedeutsamen Effekt für Anstrengung und Engagement. Wir untersuchten auch mögliche moderierende Effekte von Gewissenhaftigkeit und Pessimismus auf die Beziehung zwischen *Backup Plänen* und Anstrengung. Diese Studie ist die erste ihrer Art, die Vorhersagen der *motivational intensity theory* für Aufgaben mit unbekanntem Schwierigkeitsgrad mit der *Backup Plan* Forschung und der kardiovaskulären Reaktivität unter Anstrengung kombiniert.

Schlüsselbegriffe: Motivation, Selbstregulierung, Backup Plan, unbekannte Aufgabenschwierigkeit, kardiovaskuläre Reaktivität.