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„The Role of Willpower Lay Beliefs in Climate-Related Performance"

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Abstract

Can our inner beliefs help saving our planet? In addition to implicit theories about the malleability of the world, beliefs about willpower could also influence environmentally friendly behaviour. Research shows that a nonlimited willpower belief leads to better performance compared to a limited willpower belief. Possible explanations might be found in the flow state, the theory of learned industriousness, and the subjective perception of effort. For people with a limited willpower, the ego-depletion effect arises after a strenuous task and a break is needed. The present study extends previous research findings to the field of pro-environmental behaviour. For this purpose, possible factors influencing the relationship between nonlimited willpower belief and increased performance, are included. Task-related perceptions, such as task enjoyment, as well as the importance of climate change, could buffer the ego-depletion effect. On the other hand, high demands could intensify this effect. 178 participants took part in the correlational study online and in the lab. As part of the study participants completed a task, in which good performance resulted in a donation to a climate-friendly organization. Results show that a nonlimited willpower belief is significantly connected to better performance ($\beta = 0.17$, $p = .025$). Due to the small sample size, all other hypotheses did not reach the required level of significance. However, the significant result demonstrates that a nonlimited willpower belief is related to increased performance in pro-environmental behaviour. Future studies should examine whether this is a causal effect that can be generalized to other pro-environmental behaviours.

Keywords: Lay Beliefs of Willpower, Climate-Related Behaviour, Performance, Donation

Climate change as to say the global climate crisis is human-made and affects us all (Winter, 2000). Since 1995 the number of carbon dioxide emissions in Austria has dramatically risen from about 76 million tons to about 90 million tons in 2019 (Statistik Austria, 2022). In May 2022 a peak of 421 parts per million in worldwide CO2 emissions numbers was observed in an Hawaiian scientific observatory (Stein, 2022). The following are some of the polluters: cement production, cutting down large forests, farming, and fossil fuel combustion. The incineration of these fuels is caused by everyday life decisions like transportation choice (Winter, 2000).

As humanity contributes to global warming, finding ways to encourage the implementation of eco-friendly behaviour goals is essential. Willpower is required to start pro-environmental behaviour (PEB): many climate-friendly actions can be rather inconvenient or more strenuous like riding the bike compared to opposing actions like taking the car. Thus, self-control is needed to tackle the urge for the more convenient but climate-unfriendly action choice. Both in the workplace (e.g., making companies more sustainable) and in one`s free time an impact can be made. In the case that humanity does nothing to stop climate change a nightmarish scenario of our planet might arise. Following is one exemplary consequence for the year 2100: with a temperature rise of four degrees wildfires would happen nearly worldwide, sparing only Antarctica, causing harmful smoke that would make air intake in the outdoors unendurable (Maslin, 2021). This shows the importance of climate friendly actions to stop climate change from escalating and destroying our habitat planet earth. The current study focuses on ecological activities applicable by individuals like transportation choices, more specifically donation behaviour for a climate friendly organisation.

Everyday decisions like taking the train or bike instead of the car have an impact on climate change-related emissions. Thus, it might seem easy to mitigate the climate crisis with simple sustainable actions. In a survey carried out by the German Federal Ministry for the Environment and the German Federal Environment Agency from 2020, 65% ranked environmental and climate protection as an essential issue (Umwelt Bundesamt, 2022). Among young people (14- to 22-year-olds) the percentage was even higher (74%). This shows that the motivation of the general population to tackle climate crisis is high.

Nonetheless people often fail to engage in environmentally friendly behaviour. This attitude-behaviour gap is seen for instance in sustainable tourism and sustainable consumption (Juvan & Dolnicar, 2014; Terlau & Hirsch, 2015). Therefore, psychological research in the environmental field gets more and more important as to understand the key elements that foster

or hinder pro-environmental behaviour. New sustainable behaviours first need to be elicited for climate friendly habits to develop over time. This study looks at an implicit belief that may help eco-friendly intentions to be translated into actions.

The beliefs and thoughts that we hold about our abilities, also called implicit theories, have shown to influence our actions. Looking at climate-related behaviour the "lay beliefs about the world", an implicit theory that we hold about the changeability of the world, has already been subject to psychological research. Lay belief about the world is a dyadic concept with two ends of a continuum: Entity theory and incremental theory (Dweck, Chiu & Hong, 1995). Entity theorists hold the belief that the world cannot be changed by humans and incremental theorists believe the opposite. Lay beliefs about the world have been linked to several variables that are connected to environmentally friendly behaviour: believing in predictions of climate change outcomes or global warming and the intention to behave pro-environmentally (Soliman & Wilson, 2017). The current study aims to extend previous research about the impact of lay beliefs on environmentally friendly behaviour to lay beliefs of willpower.

Lay beliefs of willpower

Self-control often referred to as willpower is the ability to withstand urges and control one´s behaviour, emotions, and thoughts (Gailliot et al., 2007). Self-control in general is essential for effectively reaching personal goals and successful self-regulation (Milyavskaya & Inzlicht, 2017). Having high self-control has been linked to many beneficial outcomes. Among those are higher performance in academic contexts, higher income, greater physical well-being and improved social relationships when compared to low self-control ability (de Ridder et al., 2012; Duckworth & Carlson, 2013; Moffitt et al., 2011). Not only the ability to exert self-control but also the beliefs about it have an influence on behaviour.

There are two opposing lay beliefs about willpower on a continuum. Either you believe your willpower capacity to be nonlimited or limited (Francis & Job, 2018). With a nonlimited willpower belief your willpower capacity does not lessen after a task where you had to control yourself. This may entail holding back your actions, emotions, or thoughts. Having a limited willpower belief means thinking that one´s willpower capacity is like a battery. In line with this thought, willpower capacity needs to be recharged after task involving the exertion of willpower. Through this belief willpower capacity behaves accordingly and a break is required after a self-control task.

Limited willpower belief is quite common in America. In some parts of the world the nonlimited willpower lay theory is represented more widely. Participants of Indian origin for instance experienced the reverse effect of the previously described ego-depletion effect (Savani & Job, 2017). They felt even more energised after a strenuous mental task and their self-control was even improved in following tasks. In the dual task study Indian participants showed this reverse ego-depletion effect compared to western participants who experienced a loss of self-control capacity (Savani & Job, 2017). This performance difference might derive from their differing lay beliefs about willpower: Indian participants (nonlimited) and western participants (limited). In India, self-control exertion is recommended in numerous religions with origin in India for instance meditation practice in Buddhism (Savani & Job, 2017). The underlying thought is that using self-control often leads to mental balance and consequently aids rational decision making (Walsh & Shapiro, 2006). The performance difference described above has also been detected in other studies. For instance, in a study with its sample from an U.S. university, Asian citizens had stable performance after a self-control exertion task, whereas U.S. citizens showed worse performance on the second task (Seeley & Gardner, 2003). These findings taken together suggest that ego-depletion and how self-control capacity is perceived may root in cultural specificities.

Limited willpower theorists perceive that they need rest after using willpower to refill this resource. This is in accordance with the strength model of self-control which declares willpower as a muscle that needs rest after exertion (Baumeister, Vohs, & Tice, 2007). After succeeding a task where one required self-control, for a short period of time the amount of willpower will be decreased in (unrelated) subsequent tasks. Therefore, if for example you have just resisted eating too much ice-cream, you might fail to walk the stairs like you wanted to in the first place. This state of reduced self-control capacity is known as the ego depletion effect (Baumeister et al., 2007). All this stands in line with the lay belief that willpower is limited and necessitates recharging after a demanding task (Francis & Job, 2018).

The existence and workings of a nonlimited willpower is supported by the cultural specificities found in India, the theory of learned industriousness and the feeling of flow. The theory of learned industriousness states that if someone gets a reward for putting a lot of mental or cognitive effort into a task, the feeling of high exertion has reward character itself and thus decreases the aversiveness of effort (Eisenberger, 2022). Engaging in strenuous mental exertion and getting rewarded for it, leads to better self-control ability in following tasks (Eisenberger, 1992). The results of three studies show that high initial self-regulatory

exertion can subsequently lead to better performance when involving more than one initial task (Converse & DeShon, 2009).

Experiencing flow means undertaking a challenging task of high personal value at a high level of one`s ability (Csikszentmihalyi, 2009).When being in a state of flow like playing an instrument and feeling like "becoming the music itself" the ego-depletion effect is not able to unfold. Hence, one does not feel tired or strained (Francis & Job, 2018). Taken together the existence of nonlimited willpower theorists in India, the theory of learned industriousness and the concept of flow all underpin the existence of experiencing the effects of nonlimited willpower where effort becomes effortless, and performance may even be improved after self-control exertion. Persons with a nonlimited willpower belief expect willpower to be nonlimited and therefore experience it accordingly. Thus, they may tackle further self-control tasks with ease compared to limited willpower theorists.

But how does having a nonlimited willpower belief affect one`s everyday life? Having a nonlimited willpower belief has been shown to lead to better performance, especially when demands are high (Job et al., 2010). Nonlimited willpower theorists follow a better diet, carry out more physical activity, procrastinate less, have more effective goal striving, and report higher subjective well-being as well as less negative affective states (Francis & Job, 2018). In the past the effects of willpower lay beliefs have only been looked at in the research fields of academics and learning, goal setting, health, interpersonal relationships, and well-being. The current study will expand previous research and explore the connection of willpower lay beliefs and PEB.

The following section will shed a light on the mechanisms underlying the connection of willpower lay beliefs and performance. First, ego-depletion and mental fatigue play a role for limited willpower theorists as they feel tired after a task that requires self-control. On the contrary, persons with a non-limited willpower belief might not detect being tired as easily or ignore it. Like this ego-depletion is not experienced. Of course, there is an upper limit, where exhaustion is experienced by both ends of the willpower lay belief continuum. Second, the effort that is needed in self-control tasks may act as a reward itself for nonlimited willpower theorists like stated in the theory of learned industriousness (Eisenberger, 2022). This perceived reward may lead to perseverance and thus better performance in a strenuous task. This increase can be supported by research findings that show improved performance on further tasks (Converse & DeShon, 2009). Third, the expectation about willpower may cause willpower to be experienced correspondingly. In Asian countries like India self-control use is connected to positive outcomes like mental balance and Indian participants indeed showed to

have a nonlimited willpower belief and better performance compared to western participants (Savani & Job, 2017). Willpower lay belief may act like a self-fulfilling prophecy for limited willpower theorists like "this is a task that requires self-control which will lead to fatigue and the requirement of a break". Taken together not noticing mental fatigue, feeling energized and rewarded by effort itself and the underlying expectations about self-control capacity may lead to nonlimited willpower theorist's enhanced performance in various areas of life (Francis & Job, 2018). Lay beliefs have shown to impact climate-friendly behaviour (Soliman & Wilson, 2017) . Willpower lay beliefs are assumed to be of importance in PEB as many climate-related behaviour options are less convenient and thus need self-control.

There are multiple ways to operationalize climate action behaviour in studies. On the one hand self-report questionnaires like the Stanford Climate Change Behavior Survey are used to assess climate related behaviours like amount of energy used or transportation choices (Armel et al., 2011). Self-report measurements can be problematic due to effects of social desirability (Moskowitz, 1986). Advantages of self-reports are their efficiency and practicability when it comes to usage (Paulhus & Vazire, 2007). On the other hand climate action related data can be assessed on-site like energy consumption levels in private households (Aldossary et al., 2014). The current study combines the advantages of the previously described measurement options as the task is efficient, practical, less prone to social desirability and a direct measurement of climate action. The current study uses a clicking task, which directly measures climate action relevant performance. The more clicks are made the bigger the probability is for a donation to take place. The money is gifted to Atmosfair an organisation committed to climate change mitigation.

The current study aims to explore the effect of willpower lay beliefs in a new field of interest: environmentally friendly behaviour. This leads to the first assumption about willpower lay beliefs and performance in the clicking task which is connected to donation intention:

Hypothesis 1: People with a nonlimited willpower belief show a higher performance in the clicking task than people with a limited willpower belief.

Demands of the day

There are many definitions of workload that encompass the dimensions of demands concerning time, mental effort, physical effort, effort in general, frustration and performance

(Hart, 2006). Demands of the day could be seen as workload that is not restricted to work-related tasks, but involves every task done in the current day.

When having a hard, demanding day with a great deal of self-control tasks, especially limited willpower theorists are feeling major downfalls in performance (Francis & Job, 2018). Differences in performance concerning willpower theories come out more clearly at times of high demand: In one study college students with a limited theory about willpower struggled with their self-regulation in times of high demand (Job et al, 2010). In another study even more negative effects came to light: In a time of high demands college students with limited willpower belief showed more procrastination, increased consumption of unhealthy food consumption and excessive buying behaviour (Job et al. 2015). Goal striving in general showed similar effects: Having a nonlimited willpower theory led to higher expectations concerning progressing in difficult tasks and more efficient goal striving compared to limited theorists (Bernecker & Job, 2015b). The underlying mechanism in times of high demand is described as follows. Persons with a limited willpower belief detect mental fatigue and subsequently lessen the use of self-control, whereas persons with a nonlimited willpower belief can overcome it and need no break. Of course, at a very high level of self-control exertion both groups need rest. The performance gap caused by differing perceptions of mental tiredness comes out more clearly at times of high demands. Taken together, willpower lay theories may be moderated by the effects of demands of the day, as formulated in the second hypothesis:

Hypothesis 2: High demands of the day increase the relationship between willpower beliefs and performance.

Chronotype as demand

Chronotype can be defined as the "behavioral manifestation of underlying circadian rhythms of multiple physical processes" (Lin et al., 2019, p.9). The circadian rhythm refers to physiological and behaviour-linked cycles of our body and is run in a rhythmicity of 24-hours by a biological inner clock in our brains (Videnovic et al., 2014). This study will focus on one circadian rhythm: the sleep-wake cycle. The sleep-wake cycle contains two ends of a continuum: morning persons (larks) and evening persons (night owls). Larks prefer to start their days early in the morning and go to bed early, while owls like to get up late and go to sleep late at night.

The time of day can also be a factor that makes tasks feel more strenuous. When looking at these extreme ends of the continuum (larks versus night owls) it has been shown that optimal performance results if the current time of day is congruent with their chronotype (Nishida et al., 2021; Paine et al., 2006). Along these lines, it is proposed that incongruent chronotype acts as a demand and likewise moderates the linkage between willpower beliefs and climate-related performance. This assumed interaction effect leads to the next hypothesis below:

Hypothesis 3: If chronotype is incongruent with time of day, the relationship between willpower beliefs and performance increases.

Task enjoyment

The nonlimited theory of willpower seems to develop when frequently carrying out tasks connected to personal gaols that are fun or important (Sieber et al., 2019). During such tasks feelings of autonomy and vitality arise. Not only may this lead to a nonlimited perception of willpower over time but also moderate the effect of willpower lay theory on performance.

Concerning the impact of having fun while doing a task involving willpower, it has been shown that task enjoyment effectively buffers the ego depletion effect (Barber & Smit, 2014). Like this one no longer feels the need to recharge willpower resources after an exhausting task. Inducing positive mood has been shown to have the same effect on ego depletion (Baumeister et al., 2007). In this way, the exploratory hypothesis looks at the impact of task enjoyment as a moderator. More specifically, the performance gap between participants with nonlimited versus limited willpower belief is proposed to lessen as limited willpower theorists should no longer feel ego depletion which would worsen their performance in the first place, like proposed in the hypothesis below:

Hypothesis 4: With high enjoyment of the task the relationship between willpower beliefs and performance decreases.

Task importance

Tasks that are no longer enjoyed lead to ego depletion effects. But what about task importance? Being able to express the importance of a core value and thus affirming oneself, caused the ego-depletion to disappear (Schmeichel & Vohs, 2009). Disabling the ego-

depletion effect works through various motivators who can give importance to a task. Providing motivation through monetary incentive and societal importance showed to have this effect (Muraven & Slessareva, 2003). In the condition of societal importance, participants were told that they contributed to research of Alzheimer`s disease. So, increasing motivation for a task prevents the ego depletion effect – may it be through compensation with money or given the opportunity to comply with inner values. Therefore, it is suggested that importance of the task has an effect for limited willpower theorists and acts as a moderator. Through this exploratory hypothesis a light may be shed on task importance as a moderator in the context of buffering the ego-depletion-effect:

Hypothesis 5: With high task importance the relationship between willpower beliefs and performance decreases.

Climate change importance

As this study is looking at climate-related performance it is essential to take climate change importance into consideration. Just like task importance, climate change importance may reflect the motivation behind the performance. As described above being highly motivated has led to preventing or buffering the ego-depletion effect (Schmeichel & Vohs, 2009; Muraven & Slessareva, 2003). This exploratory hypothesis suggests that the more important climate change is for the participant, the better their performance is in the clicking task. This is summarized in the following assumption:

Hypothesis 6: With highly felt importance of climate change the relationship between willpower beliefs and performance decreases.

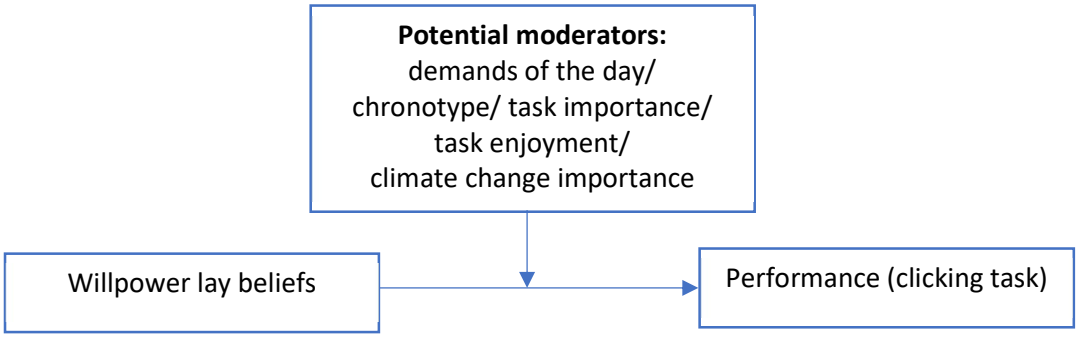

Figure 1. Illustration of the research model. All hypotheses are visualised.

Research goal

This study looks at how willpower lay beliefs (nonlimited versus limited) play a role in climate-related performance and takes the impact of various moderators which may either decrease or increase this linkage into account.

Method

Sample

For the overall study, a sample size requirement of 395 participants was calculated with a power of 80 percent, a standard 0.05 significance level and assuming a small effect size (f^2= 0.02). Concerning outliers, the following principles were planned. Data sets that stemmed from rehearsing the procedure were excluded. If someone only participated in the first part of the study their data set was left out. In addition, all questionnaires of the first and second part of the study had to be completed for the data to be included. In the current study, 179 people originally participated, of which one was excluded because of not meeting the requirements for study participation and being accidentally invited to the lab session.

The number of participants in total was 178 and consisted of 37 men, four non-binary persons and 137 women. Participants were on average 25 years old (SD= 7.37), with the overall age ranging from 18 to 70 years. In the beginning underage participants (below 18 years old) were excluded from partaking in the study. Concerning the highest level of education, most participants (109) finished high school, followed by the ones who had a bachelor`s degree (40), a master`s degree or higher (23), completed practical training (4), or had at least nine years of school (2). The participants consisted of 140 students and 38 non-students. A number of 15 participants named two or more study subjects. Most participants were psychology students (70). All other study subjects are summarized into general study domains due to their diversity and low number. Often occurring study domains were “languages, culture and social sciences” (20),” health, medicine, sports” (7), “engineering and technologies” (3), “education, administration, social” (13), “IT” (3), “Natural Sciences” (11), “economics and law” (8), “design, music, art” (7), “environmental sciences” (3) and “media, communication” (7). The question to assess political attitude ranged on a continuum from 1 (left) to 7 (right). In the current study values from 1 to 5 were ticked with an average of 2.51 (SD=1.01). Of all the participants, the majority ranked themselves to have a left political attitude (145). Some participants declared to have neither right nor left political attitude (26). One participant did not specify their political attitude.

Procedure

As the sampling method the credit system of the University of Vienna was used, a platform where students can collect credits for their university courses. Participants could choose between monetary or credit reward. The online part of the study was rewarded with 1 credit or 0.50 Euros, the second part of the study with 4 credits or 9.50 Euros.

The first part of the study took place online. Here, the participants read in detail about the procedure of the study. Next, they were informed about the risks of the measurement procedures, insurance protection and their option to stop partaking in the study at any time. In addition, they were briefed about the anonymity of their data. At the end a declaration of consent followed which the participants had to consent with to be able to continue. Afterwards the participant had to comply to the privacy policy of the University of Vienna to proceed. Then study restrictions were listed in a questionnaire. In following questionnaires, the importance of climate change, willpower lay belief, efficacy beliefs, effort enjoyment, social desirability, chronotype and demographic data were assessed.

The second part of the study took place in the motivational psychology lab of the University of Vienna. There the questionnaire about the demands of the day was filled out. In between other questionnaires and tasks were completed – all of which have no relevance for the current study. In the end participants took part in a clicking task. Before the practice trial of the clicking task information concerning Atmosfair in general was displayed along with the reasons why this specific organisation was selected for study purposes. Atmosfair is a German non-profit organization helping travellers through compensating their flights and investing their money in climate mitigation projects (atmosfair, 2022). Most of the projects (90 percent) comply to the CDM Gold Standard, a certified award for projects concerning climate protection. Before the practice trial started, participants were instructed to click as often as possible when hearing a sound on their headphones. The exercise trial of the clicking task consisted of only one beep. In the end, they got feedback about the number of their mouse clicks right away. Before the main trial of the clicking task the perceived ability concerning clicking and success importance / importance of the clicking task were assessed via questionnaires. The main trial of the clicking task consisted of 24 beeps (5 seconds sound, 10 seconds break) and the feedback was given at the end of all beeps. A donation of three Euros to the company Atmosfair was made if they reached a sufficient (unknown) number of clicks in average. After the task there was another item concerning success importance. In the end there was a short debriefing conversation. The second part of the study took about 50 minutes in total to complete.

Measures

Willpower beliefs. Willpower beliefs were measured via the German version of the willpower scale which shows high internal reliability with a value of .80 (Bernecker & Job, 2015a). Reliability was assessed with the data of the current study and proved to be high with a Cronbach`s Alpha of (.81). This scale consists of 12 items rated with a 6-point Likert scale. The Likert scale ranges from “do not agree at all” to “agree very much”. Items are for example “After a strenuous mental activity, my energy is depleted and I need to rest to replenish it.” or “When I have focused strongly on something, I feel energetic and am able to immediately tackle a new challenging task.” For statistical analysis the average value was formed. The full questionnaire is depicted in Appendix A.

Demands of the day. To operationalise the demands of the day the questionnaire NASA-TLX was applied (Hart, 2006). Reliability for this scale showed to be acceptable (.60) when computed with current study´s data. An explorative factor analysis showed that the items of the questionnaire loaded on two factors. All items except item four loaded on the first factor. Item four scored on the second factor (.89). This widely used questionnaire consists of six items which are all rated with a 5-point Likert Scale ranging from 1 “low” to 5 “high”. Example items are “How hard did you have to work to perform and accomplish what you do today?” or “How insecure, discouraged, irritated, stressed, and upset (versus secure, appreciated, satisfied, relaxed, and pleased with yourself) did you feel?”. The scale measures frustration, effort, performance, and time pressure - all in relation to (physical and mental) demands of the day on which the lab session takes place. For study purposes the questionnaire was translated to German and adapted as not to refer to a specific task (as in the original) but to the activities of the entire day. For statistical calculation purposes the mean value was used. The full questionnaire is depicted in Appendix B.

Chronotype. The chronotype of participants was assessed through the Reduced Morningness-Eveningness scale which consists of five items (Adan & Almirall, 1991). When looking at this study`s data an acceptable internal consistency of (.77) could be shown for the reduced Morningness-Eveningness scale. One of the items is formulated as follows: “How tired do you feel in the morning in the first half hour after waking up?”. Possible answers are “very tired”, “quite tired”, “quite fresh” and “very fresh”. The participant can pick one out of four to five possible options for answering each question. To statistically analyse this scale, mean values were formed. The full questionnaire can be seen in Appendix C.

Task enjoyment. Enjoyment of the clicking task was operationalised with the Task Enjoyment Scale (Czikmantori et al., 2021). Reliability of the Task Enjoyment Scale, which was

examined with the data of the current study, is high with a Cronbach´s Alpha of (.83). The scale consists of seven statements and is rated with a 6-point Likert Scale ranging from 1 (strongly disagree) to 6 (strongly agree). Example items are “the task was fun” and “the task was very tiring”. For statistical calculations, the average scores of the scale were used. The Task Enjoyment Scale is fully depicted in Appendix D.

Task importance. The importance of the clicking task was measured with a short two-item questionnaire. For study purposes, the reliability was assessed. Internal consistency of this questionnaire was very high with a Cronbach’s Alpha value of (.95) which might be an indicator for the existence of redundant items. The first item is “How important is it for you to be successful in the clicking task?”. This item is rated before the clicking task. The second item “How important was it for you to be successful in the clicking task?” is rated after the completion of the clicking task. The 11-point Likert Scale ranges from 0 (not at all important) to 10 (very important). For statistical analysis mean values were taken. The questionnaire is depicted in Appendix E.

Importance of climate change. To operationalise the importance of climate change, the famous people questionnaire was used. It consists of eight items and is an indirect measurement of climate change importance. Only the item concerning Greta Thunberg was used for statistical analysis as all other items are distractors. Therefore, reliability of the questionnaire could not be assessed. The idea behind the questionnaire resonates with the findings about Greta Thunberg. It was found that familiarity with Greta Thunberg is positively connected to collective climate action intentions through heightened collective efficacy beliefs (Sabherwal et al., 2021). In the questionnaire of the current study pictures of celebrities like Mark Zuckerberg and Greta Thunberg are shown. The participants are instructed to rate how positive or negative they perceive these persons. The 7-point Likert Scale ranges from 1 (very negative) to 7 (very positive). If the person is unknown to the participant, they can select item eight (don't know). To analyse the hypothesis connected to climate change belief only the item scores about Greta Thunberg was used. This indirect measurement of climate change importance is depicted in Appendix F.

Performance. Climate-related performance was operationalized with a mouse clicking task on the computer. In a practice run of the task they were instructed to click as many times as they could when a sound is played on their headphones. In the exercise trial they only heard one beep in total. After the practice run feedback on the number of clicks was shown on the screen. In the main trial of the clicking task 24 beeps were played on the headphones in the sequence of five seconds sound followed by a break of ten seconds. Feedback about the total amount of mouse clicks was displayed in the end. The participants were told if they reached the sufficient level of clicks after the

debriefing. If successful three Euros were donated to Atmosfair by the research team. The donation limit was exactly 37 or more clicks. For statistical analysis the total score of the clicking task was used.

Control variables. Personal efficacy beliefs, effort enjoyment, credibility concerning the donation, and perceived ability at the clicking task act as control variables. The variables age and gender were included as well. Questionnaires concerning personal efficacy, effort enjoyment and demographic data were filled out online. Credibility and perceived ability were assessed in the lab session. Perceived ability had to be ranked right after the trial run of the clicking task and credibility after the main clicking task.

Reliability of the control variable`s questionnaires were assessed through computing Cronbach`s Alpha. Overall reliability was shown to be high for the personal efficacy questionnaire (α= .86) and the effort enjoyment scale (α= .92). Personal efficacy was assessed with eight items through a 6-point Likert scale ranging from 1 “disagree” to 6 “agree completely” (Hornsey et al., 2021). The effort enjoyment scale consists of six items and was rated with a 6-point Likert scale from 1 “disagree” to 6 “agree completely”. Concerning the control variables credibility, perceived ability, age and gender no reliability could be assessed as these were only assessed with one question each.

The reasons behind including the above-mentioned variables as control variables is elaborated as follows. First, participants with high climate-change related efficacy beliefs may be more motivated as they believe they can have an impact on the climate crisis. Here, personal efficacy – the belief one`s own actions can help save the planet is considered. Second, the reason for effort enjoyment to be included as control variable is outlaid as follows. Someone who enjoys completing an effortful task in general may be at advantage when it comes to the clicking task and might perform better. Third, credibility is also considered as a control variable. Someone who does not believe that the donation really takes place and is connected to a certain unknown performance level, might not be willing to put effort into the clicking task. Moreover, high perceived ability in the clicking task may also lead to better performance. If someone feels up to the challenge, in consequence he/she may not give in so easily or loose concentration. Lastly, age and gender of the participants were also included as control variables.

Statistical analyses

To examine the first hypothesis a linear regression analysis was computed with SPSS. Concerning all the following hypotheses, which include possible moderators of the effect, a linear regression analysis was conducted for each factor. For all hypotheses, gender and ability were included as control variables. For every questionnaire with more than one item the average score of the items in total for every participant was used and mean-centred. Questionnaires with only one item were only mean-centred.

For hypothesis two the following statistical procedure was undertaken: The combined interaction effect of time of day, willpower beliefs and chronotype was looked at. This was to assess if the incongruency of time of day and chronotype influences the interaction between willpower lay beliefs and performance. Therefore, values of participants that belonged to neither type (between 12 and 17) were cut out to compare only morning and evening persons (Adan & Almirall, 1991).

The correlation between willpower, performance in the clicking task and control variables was computed. Correlations were calculated for control variables such as efficacy beliefs, perceived ability, and gender. The control variables that correlated significantly with the dependent variable performance in the clicking task were controlled for in a hierarchical regression analysis when statistically analysing all hypotheses.

Results

Descriptive and correlational results

Several significant correlative relationships between variables stand out when looking at the correlation table below. Of all control variables only ability and gender correlate significantly with the dependent variable performance in the clicking task. Thus, they were controlled for in the statistical analysis.

Table 1

Variable	M	SD	1.	2.	3.	4.	5.
1. Final score	793.07	110.28	--				
2. Willpower beliefs	3.42	0.63	.21**	--			
3. Demands of the day	2.40	0.61	-.06	-.02	--		
4. Chronotype	2.75	0.82	-.04	.05	-.06	--	
5. Task enjoyment	4.08	0.89	.22**	.12	-.13	.15*	--
6. Task importance	7.83	1.91	.22**	.02	-.15*	.08	.44**
7. Climate belief	5.43	1.41	.02	-.07	-.00	.01	-.04
8. Effort enjoyment	4.30	0.88	.09	.47**	-.13	.19*	.18*
9. Personal efficacy	4.19	0.87	.15	.13	-.05	.09	.09
10. Credibility	6.32	2.93	.05	-.12	-.10	.11	.22**
11. Ability	5.78	1.68	.21**	.07	-.16*	-.14	.25**
12. Gender	0.79	0.41	-.20**	-.18*	.10	.33**	.15*
13. Age	25.56	7.43	-.10	.03	.02	.11	.01

Variable	6.	7.	8.	9.	10.	11.	12.
1. FinalScore							
2. Willpower beliefs							
3. Demands of the day							
4. Chronotype							
5. Task enjoyment							
6. Task importance	--						
7. Climate belief	.13	--					
8. Effort enjoyment	.05	-.02	--				
9. Personal efficacy	.13	.25**	.12	--			
10. Credibility	.44**	.01	.04	.08	--		
11. Ability	.23**	-.05	.05	.07	.18*	--	
12. Gender	.18*	.11	-.07	.02	.22**	-.11	--
13. Age	-.04	-.12	-.02	-.08	.01	.06	-.08

Table 1. *Note*. Correlations among variables are depicted. Concerning willpower beliefs higher values adhere to a nonlimited willpower belief. High values in the variable chronotype are connected to being an evening person. Gender was encoded as follows: "male" = 0, "female" = 1. N= 174. * p<.05. ** p<.01.

The clicking task performance was relatively stable over the different rounds. In the bar diagram below, the range of total amount of clicks can be seen. Most participants had a final score of about 795 clicks. For this study the final score was used as the performance indicator. The average score was used as a cut off value for donation, but participants did not know the exact level they had to reach for being successful regarding the donation. Participants who reached 37 clicks or more in average over all rounds were initiating the donation to Atmosfair. 35 participants reached or excelled this level, and the highest average score was 46.29 clicks (SD= 2.70).

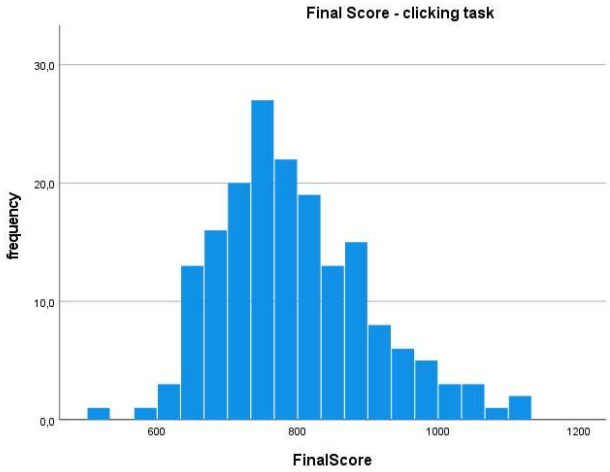

Figure 2. *Note.* Final scores in the clicking task are depicted including all participants. M= 794.9 SD= 109.9 N= 178.

Main results

Hypothesis 1, which assumed that participants with a nonlimited willpower belief show higher performance in the clicking task than participants with limited willpower belief, could be supported in a linear regression analysis (t (173) = 2.27; β = 0.17, p = .025). Further resulting values are depicted in table 2 below. Prerequisites like normal distribution of the variables and homoscedasticity for linear regressions were assessed and fulfilled. Graphs regarding the requirements for regression are depicted in Appendix G.

Table 2

R^2 = .11	F (1,173) = 5.18 p = .001

Table 2. *Note.* Model summary and ANOVA results for hypothesis 1, N= 178.

The second hypothesis stated that high demands of the day increase the relationship between willpower beliefs and performance in the clicking task. The interaction effect showed to be not significant (t (171) = -1.72; β = -7.60, p = .087). Hence, the moderation hypothesis cannot be supported. Results from the Model summary and ANOVA can be seen in table 3. Graphs that show the fulfilment of requirements for a linear regression can be found in Appendix H.

Table 3

R^2 = .12	F (3,171) = 3.97	p = .001
Coefficients:		
Willpower lay beliefs	β = -2.21	p = .111
Demands of the day	β = -7.27	p = .087
Demands of the day x willpower lay beliefs	β = -7.60	p = .087

Table 3. *Note.* The table is showing results for hypothesis 2 with model summary, ANOVA results and coefficients (main & interaction effects). N= 178.

In the third hypothesis it was expected that in the case of incongruency of chronotype and time of day, the relationship between willpower beliefs and performance increases. A number of 76 participants perceived themselves to be either a morning or an evening person. This moderation hypothesis could be backed by the results of the linear regression analysis (t (71) = 0.50; β = 0.47, p = .619). Table 4 shows further results of the regression analysis. The conditions for linear regression were fulfilled as seen in the graphs in Appendix I.

Table 4

R^2 = .18	F (4,68) = 2.13	p = .052
Coefficients:		
Willpower lay beliefs	β = 0.05	p = .684
Chronotype	β = 0.12	p = .328
Time of day	β = -0.19	p = .843
Chronotype x willpower lay beliefs x time of day	β = 0.47	p = .619

Table 4. *Note.* Model summary, ANOVA results and coefficients (main & interaction effects) are depicted for hypothesis 3. N= 76.

The fourth hypothesis stated that when it comes to participants who enjoy the clicking task the relationship between willpower beliefs and performance decreases. The interaction effect in the linear regression showed to be insignificant (t (171) = 0.02; β = 0.08, p = .986). To see the statistical results in more detail, go to table 5. Graphs depicting the prerequisites can be found in Appendix J.

Table 5

R^2 = .14	F (3,171) = 4.76	p = .000
Coefficients:		
Willpower lay beliefs	β = 0.17	p = .926
Task enjoyment	β = 0.27	p = .946
Task enjoyment x willpower lay beliefs	β = 0.08	p = .986

Table 5. *Note.* Model summary, ANOVA results and coefficients (main & interaction effects) are portrayed for hypothesis 4. N= 178.

The assumption of hypothesis 5 entailed that with high task importance the relationship between willpower lay beliefs and performance in the clicking task decreases. This hypothesis could not be supported as the main interaction effect showed to be non-significant (t (171) = -0.54; β = -2.37, p = .594). For further results, see table 6. Graphs demonstrating that conditions for a linear regression were achieved are displayed in Appendix K.

Table 6

R^2 = .15	F (3,171) = 5.20	p = .000
Coefficients:		
Willpower lay beliefs	β = - 0.00	p = .990
Task importance	β = -2.14	p = .629
Task importance x willpower lay beliefs	β = -2.37	p = .594

Table 6. *Note.* Model summary, ANOVA results and coefficients (main & interaction effects) are portrayed for hypothesis 5. N= 178.

In the sixth hypothesis it was expected that with a highly felt importance of climate change the relationship between willpower beliefs and performance decreases. This could not be backed up by the results of the interaction effect in the linear regression analysis (t (171) = -0.62; β = -2.65 , p = .534). More results are shown in table 7. The requirements for calculating a linear regression were observed as seen in graphs (Appendix L).

Table 7

R^2 = .11	F (3,171) = 3.58	p = .002
Coefficients:		
Willpower	β = 0.16	p = .029
Climate change importance	β = -2.59	p = .543
Climate change importance x willpower lay beliefs	β = -2.65	p = .534

Table 7. *Note.* In this table model summary, ANOVA results and coefficients (main & interaction effects) are depicted for hypothesis 6. N= 178.

Discussion

This study looked at a new research area for willpower lay beliefs: climate change behaviour. The effect that nonlimited willpower theorists show better performance as shown in several studies can be supported and expanded to include climate action. Nonlimited willpower theories might have ignored mental fatigue in the monotonous clicking task, perceived effort positively and expected self-control capacity to stay stable or increase over the rounds of the task. This could be the mechanisms that link nonlimited willpower belief to better performance. The task as such could be seen as 24 separate mini tasks, where you had to click as often as possible. Thus, for limited willpower theorists in any of these "mouse clicking moments" ego-depletion may arise afterwards. As mental fatigue was not measured between the beeps, it is hard to assess this assumption. For further studies, including an ego depletion task before the clicking task may help in this respect. A second benefit may be increasing the effect shown in the first hypothesis. There are already many other studies looking at willpower lay beliefs with an initial ego-depleting task (Barber & Smit, 2014; Baumeister et al., 2007; Muraven & Slessareva, 2003a; Savani & Job, 2017). All other results concerning possible moderators did not reach the needed level of significance and cannot be interpreted.

Followed up, proposed impacts of moderator variables are described. Variables like demands of the day and incongruency of chronotype were proposed to increase the interaction effect of willpower and performance. Demands of the day showed to have a non-significant interaction effect on performance. The effect of chronotype incongruency was also non-significant. Further moderators were importance of the task, task enjoyment and importance

of climate change. These were all expected to decrease the relationship between willpower and performance as they are said to buffer the ego depletion effect (Barber & Smit, 2014; Muraven & Slessareva, 2003; Schmeichel & Vohs, 2009). Task enjoyment was supposed to minimize the performance difference through inducing better mood (Barber & Smit, 2014; Baumeister et al., 2007). Unfortunately, the results concerning task enjoyment were highly non-significant. Both, importance of the task and importance of climate change were proposed to decrease the performance difference between limited and nonlimited willpower theorists through expressing a core value. Here, this core value of "climate action" should trigger good performance which was linked to a donation for climate change mitigation. Both linear regressions analyses showed to be non-significant.

Besides the low number of participants there is another possible cause for non-significancy concerning the interaction effect of willpower beliefs and demands of the day. The scale assessing demands of the day has low reliability (.60) and one item scored on a second factor. This item entailed how successful the tasks were executed. All other items referred to the level of demand. In this way, the questionnaire does not measure demands of the day accurately and results cannot be interpreted correctly.

When it comes to the non-significant results of chronotype multiple explanations come to mind. Concerning the hypothesis entailing incongruency of chronotype with the time of day an insufficient number of participants ranking themselves as "larks" or "night owls" may be the cause. Most of the participants classified themselves to be neither a morning nor an evening person. Only 76 participants in total fell into the category morning person or evening person. This number is too small to be able to interpret an effect. Only a few participants felt themselves to belong to extremes, most perceived themselves to be neither a morning person nor an evening person.

Enjoyment of the task is significantly correlated to performance (.22**) but failed to show a moderation effect on the relationship between willpower beliefs and performance. One reason for this effect may be that the ego depletion effect was only small. In this study ego depletion should have been mainly caused by demands of the day and chronotype, whose effect was insufficient as explained above. Another reason might be that task enjoyment has no impact on the connection between willpower beliefs and performance but is only associated with performance itself. This assumption could be backed by statistical results. Hence, high enjoyment of the task itself may be connected to increased performance. To

assess the impact of task enjoyment on the relationship of willpower belief and performance further research is needed to validate the assumption.

The performance difference between nonlimited and limited willpower believers did not significantly diminish with high importance of the task. Although task importance is significantly correlated to performance (.22**), no moderation effect was found. The reason for this may be that task importance was generally high in the sample. As with task enjoyment a direct effect of task importance on performance could be found. In this way perceiving the clicking task as important to oneself is linked to performance.

Climate change importance did not correlate significantly with performance. Here, the indirect measurement may be the cause, as liking Greta Thunberg may not be directly connected to one`s importance of climate change action. In this case, the main effect of climate change (Greta Thunberg item) on performance was non-significant as well as the interaction effect. Climate change importance had high values in average across all participants. The reason for this may be social desirability. Questionnaire results concerning social desirability in general showed mostly values in the middle or higher (M= 3.53, SD= 0.49). Thus, a more diverse sample concerning the importance of climate is recommended for future studies. Another possible cause can be seen in the debriefing questionnaire results. Even though the question was only about the credibility of the donation, some participants (3) actively expressed their negative attitude towards company “Atmosfair” who the donation was for. They indicated that their core goal to compensate for flights did not resonate with their ideas of climate action. Furthermore, some participants (2) said that they did not care about the donation but only about being good at the task itself. Other participants (6) thought that the donation organisation or the flyer with information about it were fake. Moreover, credibility was mixed, indicating that not everyone was sure if the donation was really going to happen or not. Most importantly for all findings the sample size of 178 participants is too small to compute all moderation effects.

Limitations, future research, and practical implications

This study supports previous findings about the connection of having a nonlimited willpower belief and performing better. Moreover, the study opens a new research area when it comes to willpower lay beliefs: climate-related performance. Nevertheless, there is room for improvement when it comes to operationalization and sample size. For future research concerning willpower beliefs and climate change behaviour multiple suggestions can be derived from the current study. Firstly, a different measurement for climate change belief like

the scale by Sinatra et al. could be used in a follow up study as it showed to have high internal reliability with a Cronbach's alpha of .85 (Sinatra et al., 2012).

Secondly, the study should be altered when it comes to the donation organisation that was used. Atmosfair was found to be controversial due to compensation of air traffic as noted in debriefing the participants. In any case, questions about the likability and familiarity with the donation organisation should be included when reusing the clicking task in combination with donation. Credibility of the donation can be a disturbance variable when it comes to performance. Because of this, ways to increase it for future studies should be found to minimize the confounding effect. Using a more widely known climate donation organisation like Greenpeace might raise credibility scores. The environmental non-profit organisation operates in 55 locations worldwide and has its own section for Austria (Greenpeace, 2023). In the current study Atmosfair seemed to be mostly unknown to the participants as seen in the debriefing and therefore not deemed trustworthy. Adding to this, presenting the flyer by the company itself might intensify mistrust as the information seems to be biased and cannot be checked during the study. This leads to the next recommendation for future studies: in giving participants some minutes time to do quick online research about the donation company might help increase credibility of the donation.

Third, regarding the sample size, future studies should have an enlarged number of participants. Like this moderation effects can be assessed with enough power. For future studies, including an initial exhaustion task is suggested to bring about a bigger effect of ego-depletion. Hence, the performance difference between nonlimited and limited willpower theorists might come out even more clearly.

The effect of nonlimited willpower beliefs on PEB could be looked at with climate related performance other than donation behaviour. Thus, in future studies actions like buying eco-friendly goods, saving water or energy, sustainable handling of property (e.g., recycling) and consumption of eco-friendly food could be assessed. These sustainable behaviours could be operationalized with via self-report questionnaires or tasks. In an overview of different measurements, PEB questionnaires with different specificities like are listed (Lange & Dewitte, 2019). For instance, there is a questionnaire that focuses on PEB in the workplace with questions like "In my work, I weigh the consequences of my actions before doing something that could affect the environment" (Boiral & Paillé, 2012, p. 442).

Next, an option for environmental tasks is suggested. Some studies have already used climate-related tasks in the lab, with the advantage of high experimental control compared to

field experiments (Lange & Dewitte, 2019). One study entailed yoghurt testing, measured recycling intentions and observed recycling behaviour in the lab right afterwards (Linder et al., 2021). They looked at whether the plastic cups were put into the right bin. Various other climate-related performance options that have already been used in studies. For instance, researchers looked at participants behaviour concerning correctly recycling study material, the amount of paper used or a transportation game where emission savings are included as a variable (Lange & Dewitte, 2019). Exploring a variety of climate-related tasks might help understand how generalisable the effect of willpower lay beliefs on PEB is. To sum up, considering several different climate-related tasks is recommended for further studies.

Climate change can only be stopped through continuous climate action. So, an additional idea for future studies is looking at the impact of willpower lay beliefs in habit formation. Having a nonlimited willpower belief has shown to be connected to improved goal pursuit (Francis & Job, 2018). To follow a goal over a longer period of time, one needs perseverance just like for habit formation. Self-control as a trait plays an essential part when it comes to habits (Verplanken & Whitmarsh, 2021). Habit formation needs frequent and consistent actions, a reward and a facilitating environment without hindrances (Fournier et al., 2017; Kaushal & Rhodes, 2015). Repetition of desired behaviour is important for forming a new habit like taking the bike or train instead of the car. A high capacity of self-control is required to keep on riding the bike on multiple occasions. This also applies to the inhibition of undesired – but often strong habits impacting climate change – like taking the car. Up to now, research has confirmed the importance of self-control for behaviour development. For instance, a study looking at habit formation in teens found that having a higher self-control capacity in the first place leads to stronger meditation habits among teens (Galla & Duckworth, 2015). In believing willpower to be nonlimited, self-control capacity is not experienced to lessen after use. Hence, the repetition of desired behaviours is facilitated. Diary studies could survey the build-up of eco-friendly behaviours over a longer period and give an insight into everyday behavioural patterns. They could entail the assessment of climate related behaviour, ego-depletion effects and willpower lay beliefs. Ego-depletion is part of our daily lives and replicating the positive effects of nonlimited willpower beliefs in our everyday lives is a good addition to lab studies and improves generalisability of the results.

Moreover, researchers might shed a light on the development of nonlimited willpower beliefs when looking at effort enjoyment. Having a nonlimited willpower belief is highly correlated to effort enjoyment and thus may play a role in the flowering of a nonlimited

willpower belief (.47**). As these are only correlative connections, it may also be the case that having a limited willpower belief leads to disliking effort. This is in line with the belief that willpower exertion is effortful and leads to mental fatigue. Here, effort is connoted rather negatively and connected to needing a break. On the other hand, the enjoyment of effort may also cause nonlimited willpower belief to thrive. Doing lots of important or enjoyable tasks has shown to lead to nonlimited willpower belief (Francis & Job, 2018). Effort enjoyment as such may be an overlooked factor here. In future studies it should be looked at the interplay of effort enjoyment and nonlimited willpower beliefs in an experimental design. Ways to increase effort enjoyment or nonlimited willpower beliefs could be used to ensure better performance. In addition to improved work or educational performance, having or fostering a nonlimited willpower belief can also be impactful in facilitating climate change action.

The results of this study prove that a nonlimited willpower belief is indeed connected to enhanced climate-related performance. In others studies, manipulations of willpower beliefs showed promising short time results: Besides reading texts about willpower being nonlimited, it is essential to find ways to strengthen nonlimited willpower belief in the long run (Francis & Job, 2018). This could be achieved through often doing fun or important tasks connected to personal goals, leading to the feeling of flow (Csikszentmihalyi, 2009). For instance, in school flow can be fostered through teacher´s behaviour (Suttie, 2012). Explaining the meaning of tasks and assignments for the children`s life or supporting learning with options to choose from independently present two of the proposed, fruitful actions.

Another way could be making the beneficial outcomes of nonlimited willpower belief visible to the public via media channels like the radio or magazines. This could be in the form of interviews with scientists. Potentially, nonlimited willpower belief might be strengthened through fostering effort enjoyment or the feeling of flow. In strengthening nonlimited willpower beliefs and understanding possible moderators we are one step closer in closing the attitude-behaviour gap in climate-related performance.

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Picture appendix

Table appendix

Appendix

Appendix A: Willpower Belief Scale

(Bernecker & Job, 2015a)

Die folgenden Fragen beziehen sich darauf, ***was Sie über verschiedene Themen, wie geistige oder körperliche Aktivitäten, denken****. Es gibt keine richtigen oder falschen Antworten. Uns interessiert Ihre Meinung. Bitte geben Sie jeweils an, wie stark Sie den einzelnen Aussagen zustimmen.*

Skala: (1 = stimme gar nicht zu, 2 = stimme überwiegend nicht zu, 3 = stimme eher nicht zu, 4 = stimme etwas zu, 5 = stimme überwiegend zu, 6 = stimme voll und ganz zu)

1. Anstrengende geistige Tätigkeiten (z.B. über ein Problem nachdenken, sich stark auf Etwas konzentrieren) erschöpfen meine Kraftressourcen, welche ich im Anschluss wieder auftanken muss (z.B. durch Pausen, Nichtstun, Fernsehen oder Essen). (R)
2. Nach einer anstrengenden geistigen Tätigkeit ist meine Energie erschöpft und ich muss mich erholen, um sie wieder aufzutanken. (R)
3. Wenn ich mich stark auf etwas konzentriert habe, fühle ich mich voller Kraft und bin im Stande, sofort eine neue herausfordernde Aufgabe anzupacken.
4. Anstrengende geistige Tätigkeiten aktivieren meine Kraftressourcen und ich bin noch besser in der Lage, mit etwas Anspruchsvollem fortzufahren.
5. Versuchungen zu widerstehen (z.B. Süssigkeiten, leckerem Essen) macht mich anfällig gegenüber anderen Versuchungen, die sich mir stellen. (R)
6. Wenn sich Situationen häufen, bei denen ich Versuchungen widerstehen muss, wird es zunehmend schwieriger, mich zurückzuhalten. (R)
7. Wenn ich eben einer starken Versuchung widerstehen konnte, fühle ich mich gestärkt, weiteren Versuchungen gegenüber standhaft zu sein.
8. Versuchungen zu widerstehen aktiviert meine Willenskraft und ich bin zunehmend besser in der Lage mich selbst im Griff zu haben.
9. Nach einer körperlichen Anstrengung brauche ich erst etwas Angenehmes (z.B. eine Pause, Essen, Fernsehen) bevor ich mit einer weiteren Aufgabe fortfahren kann. (R)
10. Wenn ich mich körperlich angestrengt habe, ist meine Energie aufgebraucht und ich muss mich erholen, um sie wieder aufzutanken. (R)
11. Nach einer körperlich anstrengenden Tätigkeit fühle ich mich voller Energie und kann gleich mit etwas Anspruchsvollem fortfahren.
12. Tätigkeiten, bei denen ich mich körperlich anstrengen muss, stärken meine Willenskraft, und ich bin im Stande, sofort eine weitere Herausforderung anzugehen.

Appendix B: NASA task load index

(Hart, 2006)

Bitte denken Sie zurück an Ihre bisherigen heutigen Tätigkeiten. Damit sind sowohl Tätigkeiten gemeint, die mit Ihrer Arbeit oder Ihrem Studium zu tun haben, als auch Tätigkeiten im privaten Bereich (wie Einkaufen, Sport machen oder Freunde treffen) oder andere Tätigkeiten. Auch die jetzige Studie gehört dazu. Bitte bewerten Sie Ihre gesamten bisherigen heutigen Tätigkeiten anhand der folgenden Dimensionen.

1. Geistige Anforderungen (z.B. Denken, Entscheiden, Erinnern, Konzentrieren ...? Waren Ihre heutigen Tätigkeiten leicht oder anspruchsvoll, einfach oder komplex, erforderten sie hohe Genauigkeit?) *[1 = niedrig bis 5 = hoch]*
2. Körperliche Anforderungen (z.B. Tragen, Transportieren, Laufen, Bewegen ...? Waren Ihre heutigen Tätigkeiten leicht oder schwer, einfach oder anstrengend, erholsam oder mühselig?) *[1 = niedrig bis 5 = hoch]*
3. Zeitdruck (Wie viel Zeitdruck empfanden Sie hinsichtlich der Häufigkeit oder dem Takt mit dem Ihre heutigen Tätigkeiten auftraten? Waren die Tätigkeiten langsam und geruhsam oder schnell und hektisch?) *[1 = niedrig bis 5 = hoch]*
4. Leistung (Wie erfolgreich haben Sie Ihrer Meinung nach Ihre heutigen Tätigkeiten ausgeführt? Wie zufrieden waren Sie mit Ihrer Leistung bei diesen Tätigkeiten?) *[1 = gut bis 5 = schlecht]*
5. Anstrengung (Wie hart mussten Sie arbeiten, um Ihre heutigen Tätigkeiten auszuführen und zu erfüllen?) *[1 = niedrig 5 = hoch]*
6. Frustration (Wie unsicher, entmutigt, irritiert, gestresst und verärgert (versus sicher, bestätigt, zufrieden, entspannt und zufrieden mit sich selbst) fühlten Sie sich?) *[1 = niedrig bis 5 = hoch]*

Appendix C: reduced morningness- eveningness scale

(Adan & Almirall, 1991)

Die folgenden abschließenden Fragen beziehen sich auf Ihren typischen Schlaf- und Wachrhythmus. Auch hier interessiert uns Ihr persönliches Erleben, es gibt also keine falschen oder richtigen Antworten.

1. Wenn es nur nach Ihrem eigenen Wohlbefinden ginge und Sie Ihren Tag völlig frei einteilen könnten, wann würden Sie dann aufstehen?
    a. 5:00 Uhr
    b. 5:15 Uhr
    c. … alle 15min eine Option
    d. 11:45 Uhr
    e. 12:00 Uhr
2. Wie müde fühlen Sie sich morgens in der ersten halben Stunde nach dem Aufwachen?
    a. Sehr müde
    b. Ziemlich müde
    c. Ziemlich frisch
    d. Sehr frisch
3. Um wieviel Uhr werden Sie abends müde und haben das Bedürfnis, schlafen zu gehen?
    a. 20:00 Uhr
    b. 20:15 Uhr
    c. … alle 15min eine Option
    d. 2:45 Uhr
    e. 3:00 Uhr
4. Zu welcher Tageszeit fühlen Sie sich ihrer Meinung nach am besten?
    a. 24:00 Uhr
    b. 1:00 Uhr
    c. … alle 60min eine Option
    d. 23:00
    e. 24:00
5. Man spricht bei Menschen von „Morgen-“ und „Abendtypen“. Zu welchem der folgenden Typen zählen Sie sich?
    a. Eindeutig „Morgentyp“
    b. Eher „Morgen-“ als „Abendtyp“
    c. Eher „Abend-“ als „Morgentyp“
    d. Eindeutig „Abendtyp”

Appendix D: task enjoyment

(Czikmantori et al., 2021)

Nun haben wir noch einige abschließende Frage zur Aufgabe.

Bitte geben Sie an, inwiefern Sie den folgenden Aussagen zustimmen.

Skala: (1 = stimme gar nicht zu, 2 = stimme überwiegend nicht zu, 3 = stimme eher nicht zu, 4 = stimme etwas zu, 5 = stimme überwiegend zu, 6 = stimme voll und ganz zu)

1. Die Aufgabe hat Spaß gemacht.
2. Die Aufgabe war sehr ermüdend.
3. Die Aufgabe war interessant.
4. Die Aufgabe war unangenehm.
5. Ich hatte Freude an der Aufgabe.
6. Die Aufgabe war langweilig.
7. Die Aufgabe war sehr anstrengend.

Appendix E: Task Importance

Success importance (before)

Bevor Sie den Hauptdurchgang beginnen, haben wir noch zwei Fragen zur kommenden Aufgabe.

Bitte geben Sie an, was am besten Ihre Gedanken und Gefühle widerspiegelt.

Skala: (0 = Überhaupt nicht wichtig, 10 = Sehr wichtig)

1. Wie wichtig ist es Ihnen, in der Klick-Aufgabe erfolgreich zu sein?

Success importance (after)

Nun haben wir noch einige abschließende Frage zur Aufgabe.

Bitte geben Sie an, was am besten Ihre Gedanken und Gefühle widerspiegelt.

Skala: (0 = Überhaupt nicht wichtig, 10 = Sehr wichtig)

1. Wie wichtig war es Ihnen, in der Klick-Aufgabe erfolgreich zu sein?

Appendix F: climate change belief questionnaire

Im Folgenden zeigen wir Ihnen einige berühmte Persönlichkeiten. Bitte beurteilen Sie, wie positiv bzw. negativ Sie diese Person finden. Wenn Sie die Person nicht kennen, wählen Sie bitte die entsprechende Option.

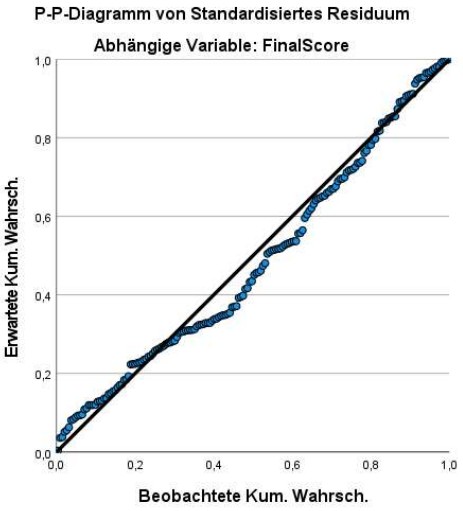
Scale: 1-7 (Sehr negativ, Negativ, Eher negativ, Weder positiv noch negativ, Eher positiv, Positiv, Sehr positiv), 8 (Kenne ich nicht)

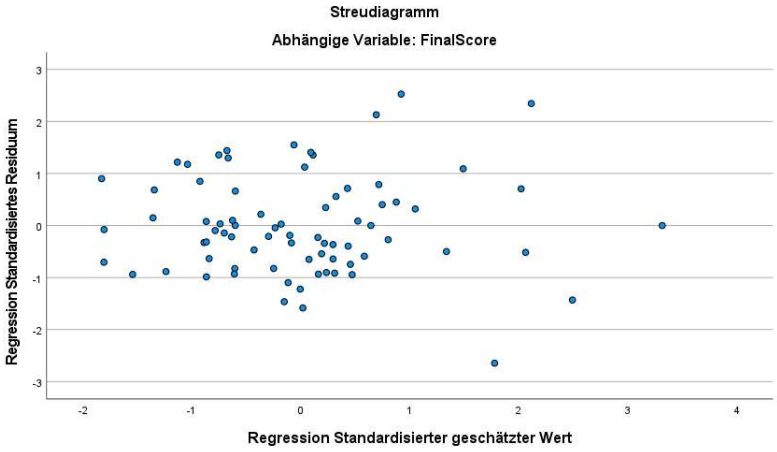
Joko Winterscheidt	**Billie Eilish**	**Mark Zuckerberg**	**Greta Thunberg**
			
David Alaba	**Karl Nehammer**	**Operah Winfrey**	**Ursula von der Leyen**
			

Bildquellen:

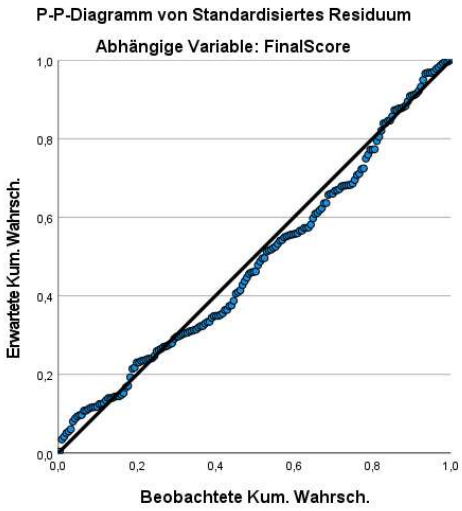
Billie Eilish (© Toglenn, https://bit.ly/35M0Icw, cropped, https://creativecommons.org/licenses/by-sa/4.0/deed.en); David Alaba (© Steindy (talk), https://bit.ly/3HlTVaB, cropped, https://creativecommons.org/licenses/by-sa/1.0/deed.en); Greta Thunberg (© European Parliament, https://bit.ly/362LZu5, cropped, https://creativecommons.org/licenses/by/2.0/deed.en); Joko Winterscheidt (© 9EkieraM1, https://bit.ly/34oFy71, cropped, https://creativecommons.org/licenses/by-sa/3.0/deed.en); Karl Nehammer (© Bundesministerium für Finanzen, https://bit.ly/35yK1o1, cropped, https://creativecommons.org/licenses/by/2.0/deed.en); Mark Zuckerberg (© Anthony Quintano, https://bit.ly/3xPNLKU, cropped, https://creativecommons.org/licenses/by/2.0/deed.en); Oprah Winfrey (© INTX: The Internet & Television Expo, https://bit.ly/3HAczvF, cropped, https://creativecommons.org/licenses/by/2.0/); Ursula von der Leyen (© Unión Europea en Perú, https://bit.ly/3rgglis, cropped, https://creativecommons.org/licenses/by/2.0/deed.en)

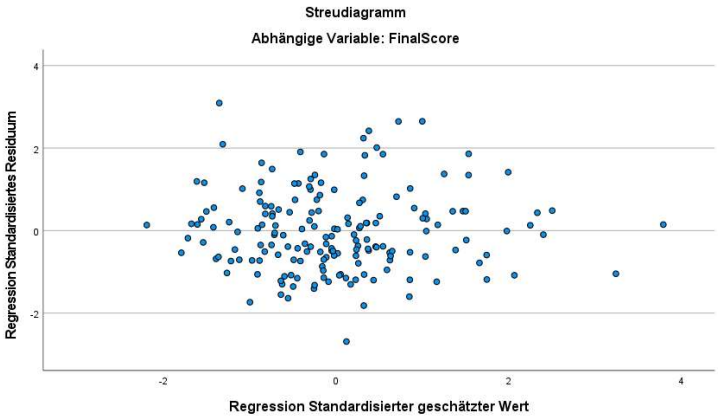
Appendix G: prerequisites for linear regression (hypothesis 1)



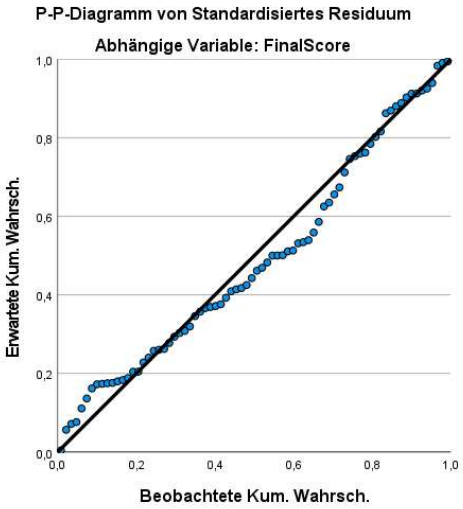


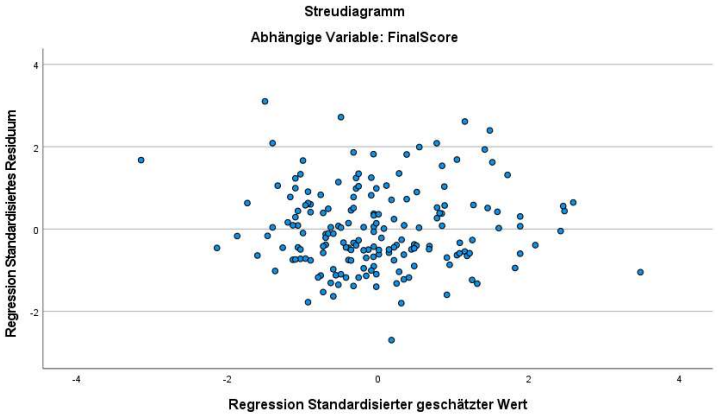
Appendix H: prerequisites for linear regression (hypothesis 2)



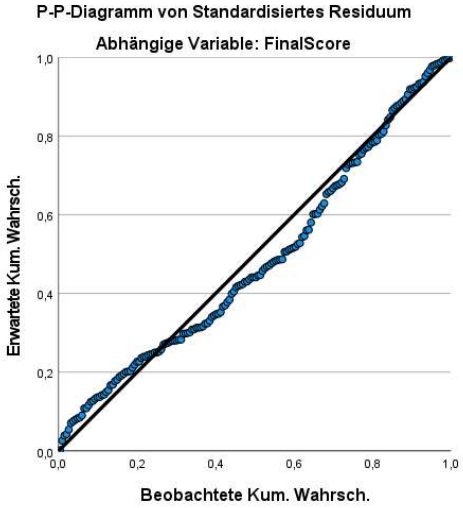


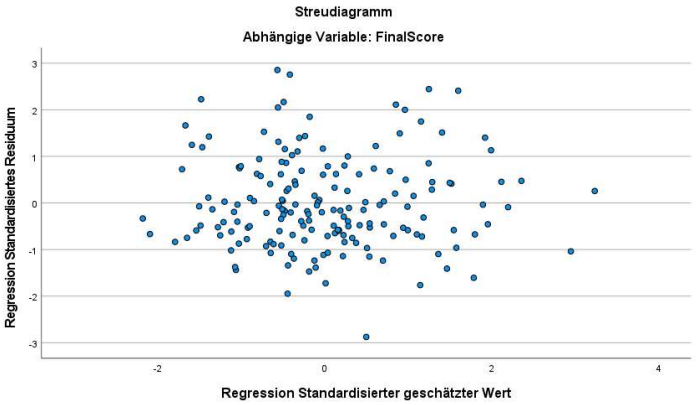
Appendix I: prerequisites for linear regression (hypothesis 3)



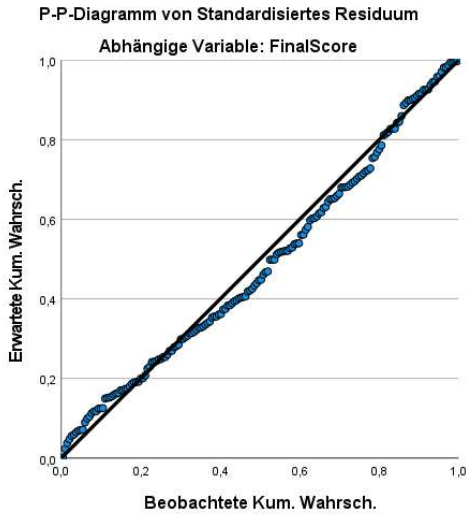


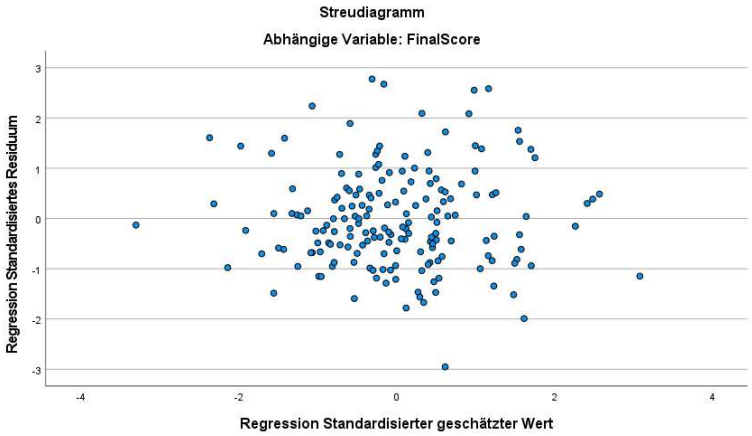
Appendix J: prerequisites for linear regression (hypothesis 4)



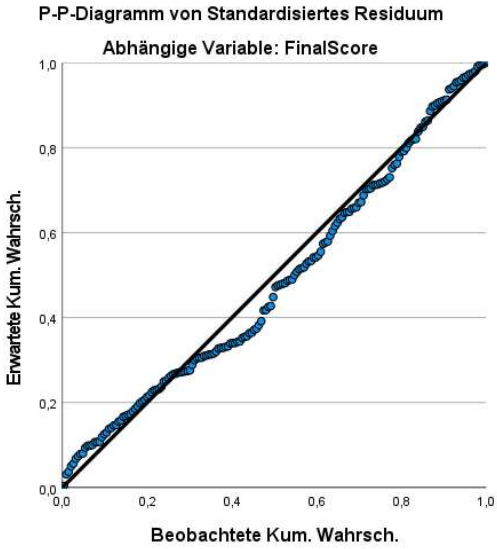


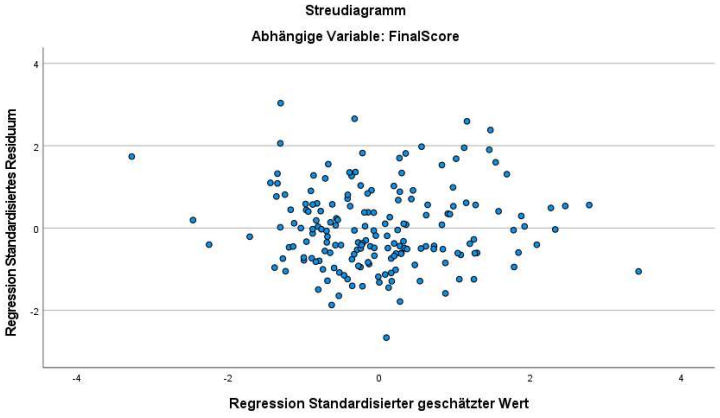
Appendix K: prerequisites for linear regression (hypothesis 5)





Appendix L: prerequisites for linear regression (hypothesis 6)





Appendix M: abstract english

Can our inner beliefs help saving our planet? In addition to implicit theories about the malleability of the world, beliefs about willpower could also influence environmentally friendly behaviour. Research shows that a nonlimited willpower belief leads to better performance compared to a limited willpower belief. Possible explanations might be found in the flow state, the theory of learned industriousness, and the subjective perception of effort. For people with a limited willpower, the ego-depletion effect arises after a strenuous task and a break is needed. The present study extends previous research findings to the field of pro-environmental behaviour. For this purpose, possible factors influencing the relationship between nonlimited willpower belief and increased performance, are included. Task-related perceptions, such as task enjoyment, as well as the importance of climate change, could buffer the ego-depletion effect. On the other hand, high demands could intensify this effect. 178 participants took part in the correlational study online and in the lab. As part of the study participants completed a task, in which good performance resulted in a donation to a climate-friendly organization. Results show that a nonlimited willpower belief is significantly connected to better performance ($\beta = 0.17$, $p = .025$). Due to the small sample size, all other hypotheses did not reach the required level of significance. However, the significant result demonstrates that a nonlimited willpower belief is related to increased performance in pro-environmental behaviour. Future studies should examine whether this is a causal effect that can be generalized to other pro-environmental behaviours.

Appendix N: abstract german

Können unsere inneren Glaubenssätze zur Rettung unseres Planeten beitragen? Neben den impliziten Theorien über die Formbarkeit der Welt könnten auch die Glaubensätze über Willenskraft Einfluss auf umweltfreundliches Verhalten haben. Untersuchungen über den Glauben an eine unbegrenzte Willenskraft zeigen, dass diese im Vergleich zu einer begrenzten zu besserer Leistung führt. Mögliche Erklärungsansätze dafür bieten der Flow-Zustand, die Theorie des erlernten Fleißes und die subjektive Wahrnehmung von Anstrengung. Bei Menschen mit dem Glauben an eine begrenzte Willenskraft, tritt nach einer anstrengenden Aufgabe ein Erschöpfungszustand ein und eine Pause wird benötigt. Die vorliegende Studie weitet die bisherigen Forschungsergebnisse auf das Thema umweltfreundliches Verhalten aus. Dazu werden mögliche Einflussfaktoren auf den Zusammenhang zwischen dem Glauben an eine unbegrenzte Willenskraft und höherer Leistung miteinbezogen. Aufgabenbezogene Wahrnehmungen, wie beispielsweise Freude bei der Bearbeitung, sowie die Bedeutung des Klimawandels, könnten dem Erschöpfungszustand entgegenwirken. Andererseits könnten hohe Anforderungen diesen Effekt intensivieren. Insgesamt 178 TeilnehmerInnen nahmen online sowie vor Ort an der Korrelationsstudie teil. Vor Ort bearbeiteten die TeilnehmerInnen eine Aufgabe, bei der gute Leistung zu einer Spende für eine klimafreundlichen Organisation führte. Die Ergebnisse zeigen, dass der Glaube an eine unbegrenzte Willenskraft signifikant mit besserer Leistung verbunden ist (β= 0.17, p = .025). Aufgrund der geringen Stichprobengröße erreichten alle anderen Hypothesen nicht das benötigte Signifikanzniveau. Das signifikante Ergebnis belegt jedoch, dass der Glaube an eine unbegrenzte Willenskraft im Zusammenhang mit einer erhöhten Leistung in umweltfreundlichem Verhalten steht. Zukünftige Studien sollten prüfen, ob es sich dabei um einen kausalen Effekt handelt und dieser sich auf andere umweltfreundliche Verhaltensweisen übertragen lässt.