The Effects of Beliefs about the Resource Capacity of Self-Control on Ego Depletion

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Abstract

The present study investigates the effect beliefs about self-control capacity have on ego depletion within the framework of the integrated approach to self-control proposed by Vohs, Baumeister, and Schmeichel (2012). Sixteen undergraduate students of California State University, East Bay completed at least one self-control measure and a questionnaire and at most an ego depleting task then a subsequent self-control measure and a questionnaire in the current study. Three main hypotheses were made. First individuals who were given an ego depleting task would perform worse on a subsequent self-control measure than individuals who were given no ego depleting tasks. Second, individuals who had been provided with an unlimited resource belief about self-control resources would perform better on a self-control measure than individuals who were provided with a limited resource belief about self-control resources. Lastly, as for the interaction between self-control resource belief and ego depletion, individuals would score, from best to worst, in a predicted order on a subsequent self-control measure after being provided with a self-control resource belief. Results from a univariate general linear model revealed statistical insignificances for the main effects and the interaction. Therefore, the results did not support any of the three hypotheses. Implications of the present study were not made as the very small sample size of the study precludes any implications from being made about the results of the study.

The Effects of Belief about the Resource Capacity of Self-Control on Ego Depletion

Self-control is the effort an individual uses to control his or hers cognitions, affect, or behavior (Muraven & Baumeister, 2000). Self-control pertains to the actions that are deliberate, conscious, and controlled responses of the self (Baumeister, Bratslavsky, Muraven, & Tice, 1998). An individual uses self-control when he or she attempts to change dominant responses in cognitions, affect, or behavior to a new response. This is to say that the individual’s self already contains preexisting patterns and responses of thought, emotion, and behavior which need to be overridden for a desired new cognition, affect, or behavior to take place (Muraven & Baumeister, 2000). Individuals use self-control in instances of delayed gratification. Instead of choosing the dominant response of gratifying oneself immediately, an individual chooses to constrain the dominant response in order to delay gratification. Without self-control, individuals would fail to delay their gratification.

One of the prominent models of self-control has been the strength model of self-control. The strength model of self-control asserts that self-control is limited in capacity. This finite resource determines the capacity for effortful control over dominant responses. It is labile as it is both vulnerable to becoming depleted over time with the usage of its resources and capable of being replenished in its resource. When self-control resources have been expended in an individual, self-control becomes impaired and self-regulatory capability becomes diminished in present acts of self-control and in subsequent acts of self-control. This impairment of self-control that results in a state of diminished self-control is called ego-depletion. Suboptimal performance on self-control tasks may be a reflection of ego depletion or the deliberate decision of an individual to reserve his self-control resources for future self-control tasks (Clarkson, Hirt, Jia, & Alexander, 2010; Hagger, Wood, Stiff, & Chatzisarantis, 2010; Martijn, Tenbult, Merckelbach, Dreezens, & Vries, 2002; Muraven & Baumeister, 2000).

A common metaphor for self-control and the ego-depletion effect has been physical fatigue. When a muscle is overused, stamina resources become depleted and the individual can no longer effectively use the muscle. Given the proper rest, the muscle becomes replenished again. Individuals vary on the amount of muscular stamina they have. Some individuals have more muscular stamina than others. Muscular stamina can be trained to increase in capacity. Self-control and its corollary ego-depletion work in a similar way to physical fatigue. When too much of a person’s self-control resources are use, the person’s self-control capacity becomes diminished. He would be prone to automatic and impulsive behaviors. The person would need to replenish his self-control resources by rest or taking appropriate fuel. He could train himself to have more self-control resource capacity in order not to experience ego-depletion again too soon (Martijn et al., 2002; Muraven & Baumeister, 2000; Vohs, Baumeister, & Schmeichel, 2012).

Research literature on self-control has been characterized by a plurality of theories on self-control with researchers contending for competing hypotheses on self-control. One group of researchers conducted three experiments on the effects of beliefs about self-control resources on ego depletion (Job, Dweck, & Walton, 2010). In summary, the three experiments showed that an individual’s performance on a self-control after ego depleting tasks corresponded with their beliefs about self-control resources. When individuals believed in a limited resource theory of self-control, they experienced ego depletion after taking self-control tasks that were ego depleting. When individuals believed in a nonlimited resource theory of self-control, they did not experience ego depletion after taking self-control tasks that were ego depleting. Therefore, researchers inferred from these results that self-control performance is an exhibition of self-fulfilling prophecy on an individual’s belief about self-control resources. Whether or not an individual exhibits ego depletion and the corollary of how well an individual performs in self-control is due solely to the subjective factor of what the individual believes. This is contrary to the strength model of self-control that views self-control as dependent on an objective resource. The strength model predicts that individuals who had believed in a limited resource theory of self-control ought to have had performed better than individuals who believed in a nonlimited resource theory of self-control, because of their pacing and their not overusing their self-control resources (Baumeister et al., 1998; Clarkson et al, 2010; Hagger et al., 2010; Muraven & Baumeister, 2000). Importantly, the researchers qualified their results and inferences in suggesting that only in some cases can ego depletion be a result of subjective factors rather than objective factors. This left open the question of what the balance or interaction was for how much ego depletion is affected by subjective factors and objective factors (Job et al., 2010).

Recently, the researchers have begun to flesh out how both objective and subjective factors of self-control are at play in self-control. Vohs et al. (2012) proposed that nature of human performance at self-control is an interaction between subjective psychological factors and objective physiological factors. Having taken into account findings from previous research (Job et al., 2010; Muraven & Slessareva, 2003) and their findings in their own research (Vohs et al., 2012), the researchers concluded that acts of self-control deplete an objective physiological energy source, while subjective factors (such as subjective belief in self-control and motivation) come to moderate ego depletion when the ego depletion is low. However, when the ego depletion is severe, subjective factors have no effect on ego depletion and may have a negative effect (Vohs et al., 2012).

The present study elaborates on previous research by further examining what effect beliefs about self-control resources have on ego depletion within the integrated approach to self-control proposed by Vohs et. al. (2012). What most differentiates this study from previous studies is that this study sought to directly investigate whether beliefs in self-fulfilling prophecies were effectual in self-control performance and moderate ego depletion. Instead of using a questionnaire to discover or induce beliefs about self-control like Vohs et al. (2012) did, this study sought to provide beliefs to individuals in a traditional matter-of-fact manner in self-fulfilling prophecy studies.

Using the implications of an integrated approach to self-control, three main hypotheses were made. First, it was hypothesized that individuals who will been given an ego depletion task would score worse on a subsequent self-control measure than individuals who will not been given any ego depleting tasks. This would be because their self-control resources would be used, whereas for the other individuals their self-control resources would be unused. This is supposing that the amount of ego depletion that would be given to the individuals would be sufficient enough that the subjective factor of belief would be superseded by the objective resource limit of self-control resources. Hence, the objective resource of self-control would be expended by those given an ego depleting task causing them to score worse on a subsequent self-control measure. Second, it was hypothesized that individuals who will be provided with an unlimited self-control resource belief would score better on a subsequent self-control measure than individuals who had been provided with a limited self-control resource belief. Having believed that their self-control capacity was unlimited would cause them to brisk their way in a self-control measure, while those who believed that their self-control capacity was limited would act in a way to preserve their self-control resources in a self-control measure. Lastly, as for the interaction between ego depletion and self-control resource belief, it was hypothesized that individuals would score, from best to worst, on a subsequent self-control measure after being provided with a self-control capacity belief in this order: individuals with an unlimited self-control belief who took no ego depleting tasks, individuals with a limited self-control belief who took no ego depleting tasks, individuals with a limited resource belief who took one ego depleting task, and individuals with an unlimited self-control resource belief who took one ego depleting task. This would be because participants who believed in an unlimited resource theory of self-control would try to brisk their way through ego depleting tasks as they would act as if they have nothing to reserve, whereas participants who believed in a limited resource theory of self-control would try to reserve their self-control resources in an attempt to pace themselves. Hence, individuals with an unlimited self-control resource belief would score worse than individuals with a limited resource belief in a treatment condition of ego depletion (they will overuse their self-control resources), but would score better in a control condition of ego depletion (there would be no ego depletion to counteract their subjective belief). Again, this is supposing that the amount of ego depletion that would be given to the individuals in the ego depletion condition would be sufficient enough that the subjective factor of belief would be superseded by the objective resource limit of self-control resources.

**Method**

**Participants**

Sixteen undergraduate students of California State University, East Bay participated in the current study. The students were enrolled in an introductory psychology course who participated in order to fulfill the psychology course requirements of research credits. They registered in the experiment by signing their names onto a posted sign-up sheet. Information on participant age, ethnicity, and gender was not collected.

**Design**

The quantitative experiment was a true-experimental 2x2 between-subjects factorial design. The two between-subjects factor independent variables of the study are ego depletion and self-control resource belief. The two levels of ego depletion are the ego depletion control condition and the ego depletion treatment condition. The ego depletion control condition consisted of no ego depletion (only the first part of a verbal editing task). The ego depletion treatment condition consisted of ego depletion (both the first and second parts of a verbal editing task). The two levels of self-control resource belief are the unlimited self-control resource belief condition and limited self-control resource belief condition. The unlimited self-control resource belief condition consisted of providing a belief that self-control resources are unlimited in their capacity. The limited self-control resource belief condition consisted of providing a belief that self-control resources are limited in their capacity. The dependent variable of the quantitative experiment was the average score on the incongruent trails on a perceptual accuracy test. This measured the extent of ego depletion caused by the experimental manipulations.

**Procedure**

The participants entered the experiment room with the experimental material on designated desks. The entirety of the experimental materials was in paper and pencil format. Participants were randomly assigned as a group to one of the four possible conditions out of a combination between the ego depletion conditions and the self-control resource belief conditions (e.g., ego depletion control condition and unlimited self-control resource belief condition).

The main procedure involved three separate parts. First, the introduction was read to the participants that included a welcoming to the experiment, details about the purpose of the study, and the self-control resource belief manipulation. In the unlimited self-control resource belief condition, participants were twice read to a short summary of research information detailing the unlimitedness of self-control capacity. In the limited self-control resource belief condition, participants were twice read to a short summary of research information detailing the limitedness of self-control capacity. The beliefs provided to the participants were made with the intent to produce an equal amount of degree of belief between the two conditions. This was a measure of controlling for any potential confound that may have resulted from a differing belief degree between the two conditions.

Second, afterwards, was the ego depletion manipulation. Participants in the ego depletion control condition were given only the first part of the verbal editing task. Participants in the ego depletion treatment condition were given the first and second parts of the verbal editing tasks. In the first part of the verbal editing task, participants were given a page from an advanced statistics book and were instructed to cross-out each e on the page in a five-minute period. In the second part of the verbal editing task, participants were given an unrelated page from the same advanced statistics book and were instructed to cross out each e on the page that was not followed by another vowel or one letter away from a vowel in a six-minute period. Having to do both parts of the verbal editing task required self-control elicitation, as the dominant habitual response learned in the first part of the verbal editing task had to be overridden in the second part of the verbal editing task. Instead of crossing out all es, participants had to cross out es only when complex rules were satisfied. Doing only the first part of the verbal editing task would not require any elicitation of self-control as nothing had to be overridden afterwards.

Lastly, the perceptual accuracy test was given to each participant to measure the extent of ego depletion from the experiment’s manipulation of ego depletion. Participants were instructed to complete a Stroop task as fast as they could and not to try to correct previous answers. They given two-minutes to complete the task. They were instructed to write the first letter of the color the color words were in underneath the color word. Three colors (blue, green, and red) produced 60 trials (30 congruent and 30 incongruent). The Stroop task is a widely used measure of ego depletion (Job et al., 2010; Vohs et al., 2012). It requires self-control in two ways. A person taking the Stroop task must inhibit his natural tendency of focusing on the word and must instead focus on the name of the color the word is in (Hagger et al., 2010). A person must also suppress the interference the meaning of the word has with the naming of the color it is in (Job et al., 2010). The Stroop task used in the experiment was adopted from a revised version (Golden, 1975) of the original test (Stroop, 1935). The words of the color were randomly distributed except for the rule that no word of a color could follow itself within a column. Only the incongruent trials of the Stoop task were scored as previous research found that ego-depletion affects performance on incongruent Stroop trials but not congruent Stroop trials (Inzlicht & Gutsell, 2007).Higher scores on the perceptual accuracy test indicated less ego depletion, whereas lower scores indicated more ego depletion.

Afterwards, all of the participants answered a questionnaire containing two questions about their experience of the study. The two questions were used as experimental manipulation checks. For an ego depletion manipulation check, one question asked participants to indicate how much mental fatigue they felt because of taking the verbal editing tasks (1 = *very low mental exhaustion*, 10 = *very high mental exhaustion*). For an self-control resource belief check, the other question asked participants to indicate how much they believed in the information given to them about self-control resource capacity (0 = *did not believe at all*, 9 = *completely believed*).

After participants completed the experimental materials, they were told to leave the experimental materials on their desk. They were given a debrief sheet and left the experimental room. Whenever data analysis was conducted on a public computer, the data file was deleted after having completed their analysis as a measure of protecting the confidentiality of participants’ data. The data file did not identify participants by name. Instead, participant data was assigned by numbers. This was another measure of protecting the confidentiality of participant’s data.

**Results**

An ego depletion (control and treatment) X self-control resource theory (limited resource theory and unlimited resource theory) factorial ANOVA (univariate general linear model) with both independent variables as between-subject factors was performed on the mean score of extent of ego depletion experienced. The analysis revealed a statistically insignificant main effect for ego depletion, *F* (1, 12) = 1.11, *MSE* = 1.61, *p* = .31. Consequently, there was no statistical difference between the mean number of extent of ego depletion between the ego depletion treatment condition and the ego depletion control condition. Even though the results were statistical insignificant, the direction of the results showed that individuals in the ego depletion treatment condition who received ego depletion tasks (*M* = 13.94) experienced more ego depletion than the individuals in the ego depletion control condition who did not receive ego depletion (*M* = 14.67). Overall, this statistically insignificant result does not support the first hypothesis of the study that individuals who received ego depletion would score worse on a self-control measure than individuals who received no ego depletion. However, the direction of the result is consistent with this hypothesis.

The analysis revealed a statistically insignificant main effect for self-control resource theory, *F* (1, 12) = 1.70, *p* = .22. Consequently, there was no statistical difference between the mean number of extent of ego depletion between the unlimited self-control resource belief condition and the limited self-control resource belief condition. The direction of the results showed that individuals in the unlimited self-control resource belief condition who were provided with an unlimited belief of self-control capacity (*M* = 13.88) experienced more ego depletion than the individuals in the limited self-control resource belief condition who were provided with a limited belief of self-control capacity (*M* = 14.75). Overall, this statistically insignificant result is not consistent with the second hypothesis of the study that individuals who are provided with an unlimited self-control resource belief would perform better on a self-control measure than individuals who are provided with a limited self-control resource belief. The direction of the result is also not consistent with the second hypothesis.

The ANOVA yielded no statistical significance for the ego depletion X self-control resource theory interaction, *F* (1, 12) = .09, *p* = .77. Thus, there was no statistical difference between the mean number of extent of ego depletion between all four of the interaction conditions. The direction of the statistically insignificant results show that individuals scored, from best to worst, on a subsequent self-control measure after being provided with a self-control capacity belief in this order: individuals with a limited self-control belief who took no ego depleting tasks (*M* = 15.00), individuals with a limited resource belief who took one ego depleting task (*M* = 14.50), individuals with an unlimited self-control belief who took no ego depleting tasks (*M* = 14.33), and individuals with an unlimited self-control resource belief who took one ego depleting task (*M* = 13.43). The statistically insignificant result does not support the third hypothesis of the study that there would be difference between the four conditions in a particular order. Also, the direction of the statistically insignificant result was not in the order in which the third hypothesis of the study predicted the interaction to be in.

For the two experimental manipulation checks, two separate independent t-tests were run for each experimental manipulation check to test whether the means from the different conditions were significantly different from one another. For the ego depletion manipulation check, *t*(14) = .03, the mean number of the degree of mental exhaustion felt was similar in the ego depletion treatment condition (*M* = 5.36, *SD* = 2.11) and the ego depletion control condition (*M* = 5.40, *SD* = 1.67). The results from the independent t-test for the ego depletion manipulation check were not statistically significant (*p* = .97). Thus, there was no statistical difference in the mean number of the degree of mental exhaustion felt in the ego depletion treatment condition and the ego depletion control condition. This result is contrary to the design of the experiment, as the treatment condition was expected to have resulted in more mental exhaustion in participants than in the control condition. The direction of the means was also contrary to the design of the experiment as the means between the treatment condition and control condition were similar.

For the self-control resource theory manipulation check, *t*(14) = .91, the mean number of degree of belief was different in the unlimited self-control resource belief condition (*M* = 5.10, *SD* = 2.56) and the limited self-control resource belief condition (*M* = 6.33, *SD* = 2.73). The direction of the result shows that participants believed more in what was provided to them about self-control capacity when the theory provided was a limited theory about self-control capacity than an unlimited theory about self-control capacity. Also, the degree of belief was moderate in both conditions, which demonstrates that the participants actually had moderately believed what was provided to them. This validates that they did in fact believe in the belief provided to them which would be required to produce a self-fulfilling prophecy. The results from the independent t-test for the self-control resource theory manipulation check, however, were also not statistically significant (*p* = .38). Thus, there was no statistical difference in the mean number of degree of belief between the unlimited self-control resource belief condition and the limited self-control resource belief condition. This is consistent with the design of the experiment as it was expected and intended that in both conditions the belief that was provided to the participants would be equally believed in degree.

**Discussion**

Overall, the hypotheses of the study were not supported by the results of the study. All of the statistical analyses run in the data analysis calculated statistically insignificant results. Because all of the hypotheses hypothesized that there would be a significant difference in the extent of ego depletion between their respective conditions, the statistically insignificant results did not support the hypotheses. The statistical insignificance of the results informs that there was no significant difference between the respective conditions in their extent of ego depletion between another. Only for the main effect for ego depletion was the direction of the means consistent with the corresponding hypothesis.

Both of the independent t-tests run for the experimental manipulation checks were statistically insignificant. The independent t-test for the ego depletion manipulation check yielded statistically insignificant results, which was contrary to the design of the study. The treatment condition and control condition were expected to yield significant differences in their mean. Interestingly, the direction of the statistically insignificant results from the ego depletion manipulation check indicates that individuals had experienced more mental exhaustion in the ego depletion control condition than in the ego depletion treatment condition, which is contrary to the result that individuals in the ego depletion treatment condition scored worse on the self-control measure than the individuals in the ego depletion control condition. There appears to be a discrepancy in how individuals have reported their extent of mental exhaustion and the objective measurements of their ego depletion. Again, most importantly, the results themselves were statistically insignificant. The statistically insignificant results from the independent t-test for the self-control resource belief manipulation check were supportive of the design of the experiment. The statistically insignificant results indicated that there was no significant difference in the degree of belief in the self-control resource theory provided to the participants in the unlimited self-control resource belief condition and the limited self-control resource belief condition.

The greatest limitation to the present study was the very small sample size (only 16 participants had participated in the present study). This would negatively affect the generalizability of the results of the experiment. A very small sample size brings the risk of the group studied not being representative of the larger population and therefore a threat to external validity. Also, with a more larger sample size, statistical significance may have been achieved. The statistical analysis could have been more meaningful. Even more so when the experimental design was a between-subjects factorial design. Having only had 16 participants overall in the data analysis is a problem for statistical accuracy and generalizability. So much so that it precludes any major theoretical and or practical implications from being made about the results of the study. Future research should conduct experiments with more participants to avoid such problems.

Another limitation of the present study was the lack of a severe ego depletion condition. Because there was no severe ego depletion condition, the experiment could not test whether beliefs about self-control capacity moderated ego depletion or came to be superseded by the objective limit of self-control resources when ego depletion was severe. Results of means from the main effect for ego depletion and the manipulation check for ego depletion indicate that the ego depletion experienced by participants from the verbal editing tasks was moderate. Future research should conduct experiment testing hypothesis with a severe ego depletion condition.

References

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource?. *Journal of Personality and Social Psychology*, *74*(5), 1252-1265. doi:10.1037/0022-3514.74.5.1252

Clarkson, J. J., Hirt, E. R., Jia, L., & Alexander, M. B. (2010). When perception is more than reality: The effects of perceived versus actual resource depletion on self-regulatory behavior. *Journal of Personality and Social Psychology*, *98*(1), 29-46. doi:10.1037/a0017539

Golden, C. J. (1975). A group version of the Stroop Color and Word Test. *Journal of Personality Assessment*, *39*(4), 386-388. doi:10.1207/s15327752jpa3904\_10

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, *136*(4), 495-525. doi:10.1037/a0019486

Inzlicht, M., & Gutsell, J. N. (2007). Running on empty: Neural signals for self-control failure. *Psychological Science*, *18*(11), 933-937. doi:10.1111/j.1467-9280.2007.02004.x

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion-is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science*, *21*(11), 1686-1693. doi:10.1177/0956797610384745

Martijn, C., Tenbült, P., Merckelbach, H., Dreezens, E., & de Vries, N. K. (2002). Getting a grip on ourselves: Challenging expectancies about loss of energy after self-control. *Social Cognition*, *20*(6), 441-460. doi:10.1521/soco.20.6.441.22978

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle?. *Psychological Bulletin*, *126*(2), 247-259. doi:10.1037/0033-2909.126.2.247

Muraven, M., & Slessareva, E. (2003). Mechanism of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin*, *29*(7), 894-906. doi:10.1177/0146167203029007008

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, *18*(6), 643-662. doi:10.1037/h0054651

Vohs, K. D., Baumeister, R. F., & Schmeichel, B. J. (2012). Motivation, personal beliefs, and limited resources all contribute to self-control. *Journal of Experimental Social Psychology*, *48*(4), 943-947. doi:10.1016/j.jesp.2012.03.002