

EMPIRICAL ARTICLE

The final step effect

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Abstract

Suppose you need to complete a task of 5 steps, each of which has equal difficulty and pass rate. You somehow have a privilege that can ensure you pass one of the steps, but you need to decide which step to be privileged before you start the task. Which step do you want to privilege? Mathematically speaking, the effect of each step on the final outcome is identical, and so there seems to be no *prima facie* reason for a preference. Five studies were conducted to explore this issue. In Study 1, participants could place the privilege on any of steps 1–5. Participants were most inclined to privilege step 5. In Study 2, participants needed to pay some money to purchase the privilege for steps 1–5, respectively. Participants would pay most money for step 5. Study 3 directly reminded participants that the probability of success of the whole task is mathematically the same, no matter on which step the privilege is placed, but most of the participants still prefer to privilege the final step. Study 4 supposed that the outcomes of all steps were not announced until all steps were finished, and asked how painful participants would feel if they passed all steps but one. People thought they would feel most painful when they failed at the final step. In Study 5, an implicit association test showed that people associated the first step with easy and the final step with hard. These results demonstrated the phenomenon of the final step effect and suggested that both anticipated painfulness and stereotype may play a role in this phenomenon.

1. Introduction

There is a Chinese expression called ‘reassurance pill’, which means something that sets one’s mind at ease because it can solve some problem for sure. Suppose you need to complete a task of 5 steps, each of which has equal difficulty and pass rate. You somehow have a privilege that can ensure you pass one of the steps (i.e., you can have a reassurance pill for one of the steps), but you need to decide which step to be privileged before you start the task. Which step do you want to privilege? Mathematically speaking, the effect of each step on the final outcome is identical, and so there seems to be no *prima facie* reason for a preference. Is that the case? Which step would people place the ‘reassurance pill’ on? To answer these questions, we designed and carried out 5 studies.

So far, as we know, no literature has addressed the above questions. We report here that people prefer the last step. Some previous literature seems related to such a finding.

The goal gradient hypothesis concerned the relationship between the proximity of a goal and the individual’s propensity to accomplish it (Brown, 1948; Hull, 1932). This hypothesis proposed that the closer a person was to her/his goal, the more motivated she/he was to invest in that goal (Koo and Fishbach, 2012). Related studies have shown that this effect arises because people have a need for an end, because the value function of the goal is steeper as the goal is approached (Heath et al., 1999), or

because the subjective distance to the goal decreased by a greater percentage as the goal is approached (Brendl and Higgins, 1996; Forster et al., 1998). In the above studies, people became more motivated when they were closer to their goal, which is normal. In our research, the participants needed to decide which step to be privileged before the game started, and privileging any step brought the participants equally close to their goal; therefore, preferring a special step is abnormal. In other words, our research differed from the above research in both crucial elements and abnormality.

Another finding similar to the final step effect (FSE) was the bomb party experiment (BPE) (Ayton, 2011). BPE assumed that a barrel had 6 crackers, 5 containing checks for huge amounts and the other containing a bomb. Six guests each needed to draw a cracker and pull it and got whatever it contained (i.e., got a huge amount or death). Each participant needed to imagine he was a guest, and answered which position he thought had the best chance of surviving and he would rather go. Most participants chose the first position. Nevertheless, FSE was essentially different from BPE. (1) The whole concepts were different. FSE essentially explored how people allocated resources to several steps of a task to secure the success of the whole task, while BPE essentially explored how people chose one safer and beneficial position among several ones. (2) The game rules were essentially different. FSE assumed that each participant needed to finish all the 5 steps to secure the success, but BPE assumed that only one position chosen by the participant was directly relevant to his success or death. (3) The crucial mental processes were different. In BPE, many people consciously thought the probability of the first position having a bomb was least among the six positions. In FSE, people consciously knew that the difficulty and passing rate of each step were equal. (4) The results were totally different: Most people thought position 1 had the best chance of surviving and thus preferred position 1 in BPE, but most people preferred the final step in FSE as revealed below.

To explore the final step effect, we carried out 5 studies recounted below.

2. Study 1

This study directly asked participants to place the privilege on one of the steps.

2.1. Method

2.1.1. Participants

We recruited participants by posting advertisements in social media groups consisting of students of our university. We recruited 60 participants (48 females; mean age = 20, $SD = 1.45$). They got paid for their participation.

2.1.2. Materials and procedure

This study adopted a within-participant design and contained 5 scenarios. The order of the scenarios was randomized. Each scenario consisted of 5 steps with the same difficulty and pass rate. Participants had a privilege that could ensure them to pass 1 of the 5 steps, and they needed to decide which step to be privileged before they started the task. We counterbalanced the order of options: for half of the participants, option order was step 1 to step 5; for the other half of the participants, the opposite was arranged. One scenario is given below and all are included in the [Supplementary Material](#).

Suppose in a knowledge contest, you need to answer 5 questions, each having the same difficulty. If you do it by yourself, the pass rate for each question is 50%. There is a privilege that can make you obtain the correct answer of one of the questions directly. Which question would you like to place this privilege on?

2.2. Results

For each step in each scenario, we counted the number of participants who chose that step ([Figure 1](#)). The results showed that most participants chose to privilege step 5 rather than any other step.

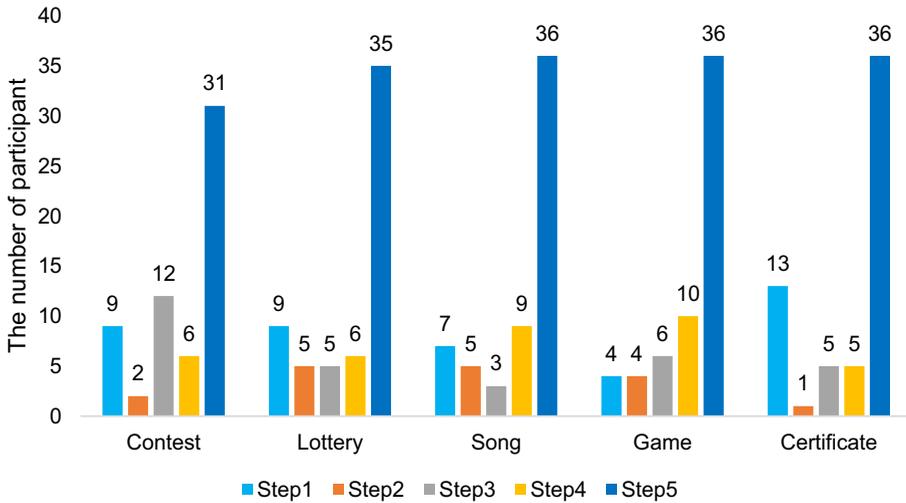


Figure 1. The number of participants privileging each step in the 5 scenarios. The 5 scenarios were a knowledge contest, a lottery game, guessing the names of songs, an electronic game, and a certificate exam.

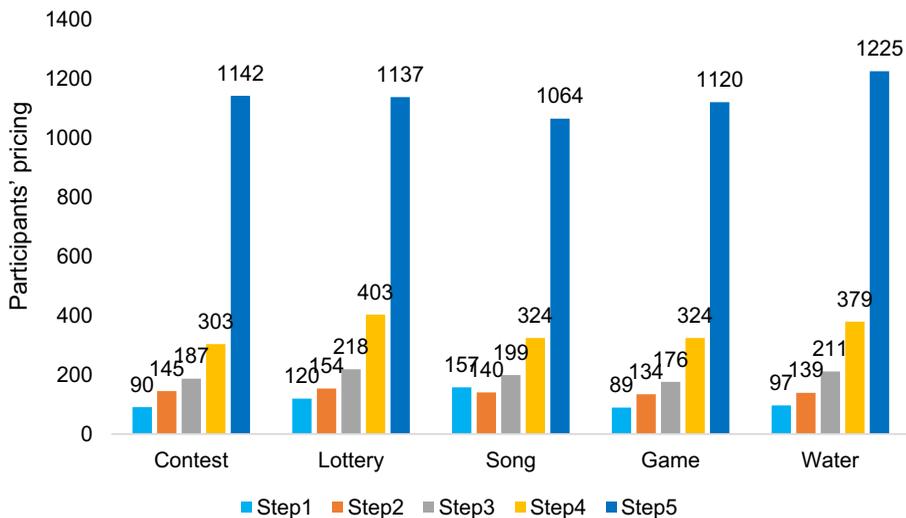


Figure 2. Participants' pricing for each step. The 5 scenarios were a knowledge contest, a lottery game, guessing the names of songs, an electronic game, and an above-water challenge game.

3. Study 2

Study 1 measured participants' preference by their choices. Study 2 measured it by their pricing for the privilege for each step respectively.

3.1. Method

3.1.1. Participants

We recruited participants by posting advertisements in social media groups consisting of students of our university. We intended to recruit 60 participants but 62 participants (46 females; mean age = 20, $SD = 1.45$) showed up. They got paid for their participation after finishing tasks.

3.1.2. Materials and procedure

The materials were similar to Study 1. The main difference was, instead of choosing among 5 steps (in Study 1), participants in Study 2 needed to state how much they would like to pay (i.e., their pricing) for the privilege for each of the 5 steps, respectively. It was supposed that only if participants passed all the steps, they would win 8,888 Yuan (~\$1,264). See details of the materials in the [Supplementary Material](#). This study adopted a within-participant design, randomization of scenarios, and counterbalance of the order of options as Study 1 did.

3.2. Results

We calculated their pricing for each step in each scenario ([Figure 2](#)). For steps 1 to 5, the overall average pricing was 111, 142, 198, 347, and 1,137 Yuan, respectively. As expected, participants were willing to pay the most for the final step rather than any other step.

4. Study 3

The purpose of Study 3 was to reduce the probability that some participants misunderstood the questions so as to think privileging step 5 could entail the greatest chance of success of the whole task.

4.1. Method

4.1.1. Participants

We recruited participants by posting advertisements in social media groups consisting of students of our university. Fourteen participants completed the study in our laboratory, and 49 participants answered the experimental questions online at their own places due to later pandemic control. Totally, there were 63 participants (33 females; mean age = 21, $SD = 2.43$) in this study. Given that this study had a within-participant design, these two kinds of experimental space should not be a big issue for the results. All the participants answered the experimental questions on an online survey platform (www.wjx.cn). Participants got payment for their participation.

4.1.2. Materials and procedure

This study was similar to Study 1. The main difference was that the instruction of this study directly told participants ‘mathematically, the probability of success of the whole task is the same no matter on which step the privilege is placed’. This could reduce participants’ misunderstanding or miscalculating the relevant chances. All scenarios appearing in Study 1 or 2 were included in Study 3.

4.2. Results

For each step in each scenario, we counted the number of participants who chose that step ([Figure 3](#)). Most participants chose to privilege the final step rather than other steps, though the instruction directly told them that the chances of success of the whole task were equal whichever step he/she chose to privilege. These results were similar to those of Study 1.

These results suggested that this FSE probably arose from not consciously misunderstanding or miscalculating the chances (like the Monty Hall Problem) but somewhere else. Nevertheless, this study is somewhat inconclusive because it had no check on whether subjects read and believed the statement about probabilities. Studies 4 and 5 (in the [Supplementary Material](#)) would further explore its origin.

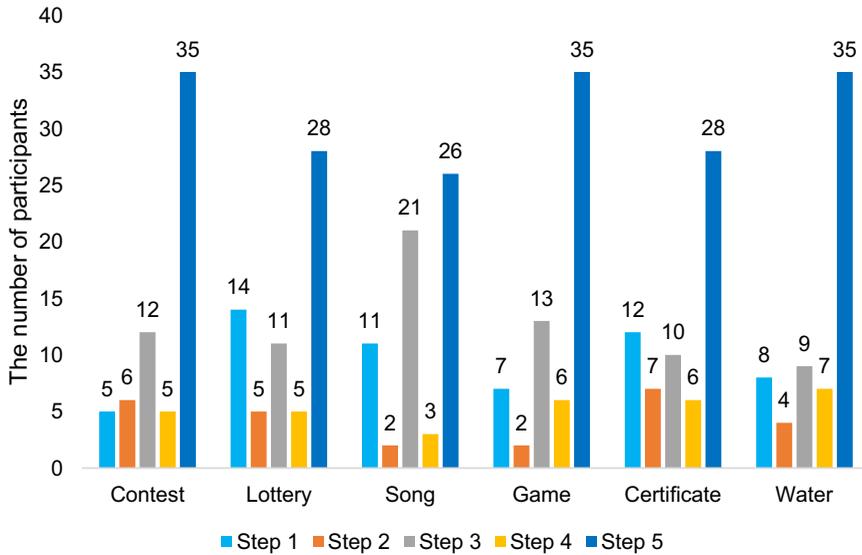


Figure 3. The number of participants privileging each step in each scenario.

5. Study 4

The purpose of Study 4 was to explore the role of emotion in this FSE.

5.1. Method

5.1.1. Participants

One hundred and eighteen participants (94 females; mean age = 21, $SD = 1.52$) recruited via social media groups from our university completed the study in a laboratory. They answered the experimental questions on an online survey platform (www.wjx.cn). We arranged the participants to finish this online study in the lab rather than at their own places so as to collect high-quality data. The participants were paid for their participation.

5.1.2. Materials and procedure

The study adopted a within-participant design. This study essentially asked how painful the participants would feel if they failed in one of the five steps. The specific experimental scenario is translated below:

Imagine that you are going to take a certificate exam that includes 5 subjects, each having the same difficulty and the same pass rate. Only passing all the 5 subjects can render you the final success. The exams of subjects 1, 2, 3, 4, and 5 were scheduled 1, 2, 3, 4, and 5 months after the registration date, respectively. The scores of the subjects will not be announced until tests of all subjects are completed.

Suppose you passed all the subjects except subject 1 (2/3/4/5), how painful would you feel?

They indicated their pain on an 11-point scale (0 = no feeling; 10 = extremely painful).

We counterbalanced the order of questions—for half of the participants, the questions went from subject 1 to subject 5; for the other half participants, the opposite was arranged.

5.2. Results

We calculated participants' average pain for failing in one of the steps (Figure 4). Participants thought they would feel the most painful when they did not pass the final subject.

This study (Study 4) showed that people placed more emotion on the final step as they placed more resources on it and suggested emotion may play a role in this FSE. Study 5 (in the Supplementary

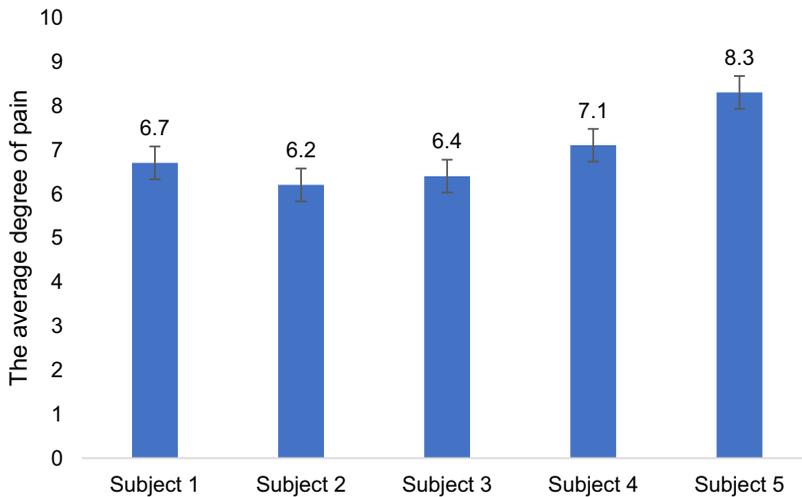


Figure 4. The degree of pain that participants thought they would feel when they did not pass one of the subjects. Error bars represent ± 1 standard error.

Material) found that participants implicitly associated the final step with hard. This stereotype might drive people to allocate more resources to the seemingly hard step (the final step).

6. General discussion

The current research tried to explore the FSE and its origin. Study 1 showed that participants chose to privilege the final step rather than other steps even though the difficulties and pass rates of all steps were equal. Study 2 showed that participants priced the privilege of the final step highest. Study 3 replicated the result of Study 1 even though the instruction directly told the participants that the chances of success of the whole task were the same no matter on which step they placed the privilege. Study 4 showed that participants thought they would feel most painful if they failed in the final subject of a serial exam even though the scores of all subjects were announced after they were all completed. Study 5, using an implicit association test, showed that participants implicitly associated the final step with hard.

Why did this happen? That is, how can we explain participants tend to privilege the last step? First, let us consider the goal gradient hypothesis. The goal gradient hypothesis suggested that the closer a person was to his/her goal, the more motivated he/she was to invest in that goal (Koo and Fishbach, 2012). In our studies, given that each step had the same difficulty and pass rate, using the privilege to pass any step brought the participant equally close to the goal. Therefore, the goal gradient hypothesis cannot explain these results.

Study 3 showed that the FSE existed even if the participants were directly told that the chances of success of the whole task were equal whatever they chose. Therefore, this effect probably did not arise from conscious misunderstanding or miscalculating of relevant chances.

Study 4 suggested that emotion may play a role in this phenomenon. A lot of previous research showed that emotions (e.g., anticipated regret and disappointment) play a crucial role in decision-making (Baron et al., 2018; Bell, 1982; Kahneman et al., 1993; Lerner et al., 2015; Loewenstein and Prelec, 1993; Loomes and Sugden, 1982, 1986; Zultan et al., 2010). In Study 4, people anticipated that if they failed in the final step rather than other steps they would feel the most painful. To avoid this painfulness, they would allocate the most resource to the final step. Study 5 suggested that the stereotype of the final step being hard may play a role in this FSE.

In a word, through these 5 studies, we demonstrated the FSE, which may root from both anticipated painfulness (an emotional factor) and stereotype (a cognitive factor).

Much remains unknown about the nature of this phenomenon. For example, although it does not seem to result from beliefs about probability, it may have to do with the perception of causality. The last step may be seen as a more direct cause of the outcome. Future studies might ask about that.

Otherwise, insight into the mechanism could be gained by manipulation of several factors: the number of events could vary, to as few as two; the probability of each event could vary; and ‘win’ and ‘lose’ could be switched.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/jdm.2022.4>.

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Author contributions. J.Z. and Y.Y. made contributions of the same importance and thus were co-first authors.

References

- Ayton, P. (2011). The bomb party probability illusion. In W. Brun, G. Keren, G. Kirkeboen, & H. E. Montgomery (Eds.), *Perspectives on thinking, judging, and decision making* (pp. 76–87). Oslo : Universitetsforlaget.
- Baron, J., Gureay, B., & Luce, M. F. (2018). Correlations of trait and state emotions with utilitarian moral judgements. *Cognition & Emotion*, 32(1), 116–129. <https://doi.org/10.1080/02699931.2017.1295025>.
- Bell, D. E. (1982). Regret in decision-making under uncertainty. *Operations Research*, 30(5), 961–981. <https://doi.org/10.1287/opre.30.5.961>.
- Brendl, C. M., & Higgins, E. T. (1996). Principles of judging valence: What makes events positive or negative? *Advances in Experimental Social Psychology*, 28(08), 95–160. [https://doi.org/10.1016/S0065-2601\(08\)60237-3](https://doi.org/10.1016/S0065-2601(08)60237-3).
- Brown, J. S. (1948). Gradients of approach and avoidance responses and their relation to level of motivation. *Journal of Comparative and Physiological Psychology*, 41(6), 450–465. <https://doi.org/10.1037/h0055463>.
- Forster, J., Higgins, E. T., & Idson, L. C. (1998). Approach and avoidance strength during goal attainment: Regulatory focus and the “goal looms larger” effect. *Journal of Personality and Social Psychology*, 75(5), 1115–1131. <https://doi.org/10.1037/0022-3514.75.5.1115>.
- Heath, C., Larrick, R. P., & Wu, G. (1999). Goals as reference points. *Cognitive Psychology*, 38(1), 79–109. <https://doi.org/10.1006/cogp.1998.0708>.
- Hull, C. L. (1932). The goal gradient hypothesis and maze learning. *Psychological Review*, 39(1), 25–43. <https://doi.org/10.1037/h0072640>.
- Kahneman, D., Fredrickson, B. L., Schreiber, C. A., & Redelmeier, D. A. (1993). When more pain is preferred to less – Adding a better end. *Psychological Science*, 4(6), 401–405. <https://doi.org/10.1111/j.1467-9280.1993.tb00589.x>.
- Koo, M., & Fishbach, A. (2012). The small-area hypothesis: Effects of progress monitoring on goal adherence. *Journal of Consumer Research*, 39(3), 493–509. <https://doi.org/10.1086/663827>.
- Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and decision making. *Annual Review of Psychology*, 66, 799–823. <https://doi.org/10.1146/annurev-psych-010213-115043>.
- Loewenstein, G. F., & Prelec, D. (1993). Preferences for sequences of outcomes. *Psychological Review*, 100(1), 91–108. <https://doi.org/10.1037/0033-295x.100.1.91>.
- Loomes, G., & Sugden, R. (1982). Regret theory – An alternative theory of rational choice under uncertainty. *Economic Journal*, 92(368), 805–824. <https://doi.org/10.2307/2232669>.
- Loomes, G., & Sugden, R. (1986). Disappointment and dynamic consistency in choice under uncertainty. *Review of Economic Studies*, 53(2), 271–282. <https://doi.org/10.2307/2297651>.
- Zultan, R. I., Bar-Hillel, M., & Guy, N. (2010). When being wasteful appears better than feeling wasteful. *Judgment and Decision Making*, 5(7), 489–496.

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