

Copyright
by
Eumie Jhong
2020

The Thesis Committee for Eumie Jhong

Certifies that this is the approved version of the following thesis:

Regulatory Fit across Levels of Abstraction

APPROVED BY

SUPERVISING COMMITTEE:

SUPERVISOR:

Mary M. Hayhoe

Frances Champagne

Regulatory Fit across Levels of Abstraction

by

Eumie Jhong

Thesis

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

In Partial Fulfillment

Of the Requirements

For the Degree of

Master of Arts

The University of Texas at Austin

August 2020

Dedication

I would like to dedicate this thesis to my parents, Phillip and Janet Jhong, as well as my sister, June Jhong. Thank you for always being my cheerleader and believing in me even during moments when I didn't myself. Love you so much!

Acknowledgements

I would like to give thanks to Dr. Frances Champagne and Kimberly Terry for guiding me and helping me throughout my education path. Your support and patience have taught me so much throughout my academic career, and I hope to someday become an amazing mentor like you both.

Abstract

Regulatory Fit across Levels of Abstraction

Eumie Jhong, M.A.

The University of Texas at Austin, 2019

Supervisors: Mary Hayhoe and Frances Champagne

ABSTRACT

Previous research has shown that regulatory fit has different effects on cognitive processes, such as the ability to make abstractions, or identifying various levels of perceptual characteristics from the environment. In the current study, we measured perceived abstractions under different environments of regulatory fit and mismatch by having the participants identify conceptual abstractions of distance and size, such as “far” and “large” under different regulatory environments of either fit or mismatch. Results showed no effect in reaction time in making associations between the different abstractions under the different regulatory environments, which reveals that more studies is needed to provide further insight into the relationship of different regulatory mindsets and its influence on cognitive processes, such as making associations and abstractions across different categories of conceptual words and pictures.

Table of Contents

List of Figures	x
INTRODUCTION	1
METHOD	8
Participants	8
Materials	8
Pre-Test Demographics Questionnaire	8
Hierarchical Visuals Task.....	8
Design and Procedure	10
RESULTS	13
Manipulation Check	13
Practice Performance	13
Performance and Time-Spent Analysis	13
DISCUSSION	15
FIGURES	16

List of Figures

Figure 1: Mean time spent on task for each motivation type	16
Figure 2: Visual example of abstract task of global concept, “far” with image	17
Figure 3: Visual example of concrete task of local concept of “small” with image	18

INTRODUCTION

The purpose of this study is to explore the influences of regulatory mindset on cognitive performance, such as making abstractions across words and pictures. In design, ideas are often conceptual and do not possess obvious or concrete details or cues from the physical world. Such abstract ideas without actual or physical traits would have to be correlated somehow with the physical world for the design to be actualized in the form of a product or service. I first review literature on the effects of regulatory focus on promoting different levels of abstractions. After, I discuss the framework and practical implications of making abstractions under different regulatory focuses. Finally, I present the purpose of the current experiment and how this research advances our understanding of regulatory fit and the ability to make abstractions. At the end, I discuss the study limitations and potential directions for future research.

Effects of Making Abstractions and Thinking

So how do designers learn to navigate and generate concepts in unconventional environments such as virtual reality and architectural design? This is where the process abstraction comes in to help bridge that gap between the physical and the abstract realities. Abstraction, according to Langer, is the act of considering things as general qualities or characteristics, apart from the concrete realities, specific objects, or actual instances (1953). In other words, it is a “process of identifying a set of invariant central characteristics of a thing” (Burgoon, Henderson, & Markman, 2013). These invariant central characteristics may be internal and consist of “observable features, behaviors”, or external and consist of “functions, roles things play, goals things help to accomplish, overall structure or meaning of things” (2013). The ability to abstract “operates on a continuum” (2013) and the “levels of abstraction reflect this” (2013). Lower levels of abstraction are associated with “higher levels of concreteness”, and capture thoughts

that are more “specific, detailed, vivid, and imageable” (2013). Higher levels of abstractions (i.e. lower levels of concreteness), include fewer readily observable characteristics and therefore capture thoughts that are less “imageable (e.g. friendly dog, beautiful cup)” (2013).

Different levels of abstractions help people think in more concrete or abstract terms and mindset across different contexts or environments. This mindset of hierarchical thinking also translates over to attenuating to perceptual information either by focusing on the entire figure, or Gestalt (global scope), or on the disparate details of the stimulus, (local scope) (2013). Navon (1977) conducted the classic study on perceptual hierarchal processing through constructed visual patterns where global or larger letters are constructed from arrangements of local or smaller letters. Global processing was found to be associated with the overall form or shape, and local processing was found to be more closely associated with the detailed patterns within the outlined form (1977). His study indicated the possibility of abstracting local and global levels of processing over to the processing of perceptual local and global letters. However, the Navon Letters Task received criticism for the confounding variables that could occur, one of them being that the small sizing and the narrow-spacing of the arranged letters that composed the larger letters. Such a narrow arrangement could bias the participants towards identifying more with the Gestalt view of the larger shape rather than focusing the comprising patterns simply because they are difficult to discern. Kimchi-Palmer (1982) modified the Navon Letters task to control for this criticism by incorporating fewer geometric shapes making up the overall patterns or outlines that the participants could more easily identify as local versus global representations. Participants were given a target figure that was a large geometrical shape comprised of different geometrical shapes. Then two more figures are presented where one of the figures match the local elements of the target figure, and the other figure matches the global element of the target figure.

Depending on the different targeted levels of abstractions, participants would choose, or associate, the local or global patterns of the given choices to the target visual figure. Such hierarchical letters tasks show that abstractions can be made at local and global levels across various contexts, including perceptual environments.

By identifying the various levels of perceptual characteristics from the environment, and mapping “conceptual abstractions” (Förster & Dannenberg, 2005) across various stimuli and contexts, psychological distance is made by traversing across different environments, which “broadens mental horizons” (Trope & Liberman, 2010), and enables people to “focus on central characteristics that are likely to be invariant across distance” (2010). And “as things become more psychologically distant, people think about them at progressively higher levels of abstraction” (Burgoon, Henderson, & Markman, 2013), which in turn can help designers to interpret and perceive from their environment the general outlines or characteristics of spaces past the concrete or specific details across different domains. Such general characteristics can then create “less constrained outlines, form, and color to the design environment that can exist with a degree of independence from the physical world” (Arnheim, 1969). In other words, higher levels of abstractions or generalizations can help serve as fluid conceptual cues from different domains and environments based on general shared characteristics and relations, and help designers generate novel and original representations and concepts for ideas.

Effects of Regulatory Fit on Abstractions

In order to make abstractions, various cognitive processes also come into play to help engender this process, such as regulatory focus – specifically promotion and prevention focus. Higgins proposed the theory of regulatory focus and regulatory fit (1997) to explain how goal orientation of the different motivational states can be met by either approaching or avoiding

mismatches to that end-state. Regulatory focus theory (Higgins, 1997) stems from the approach-avoidance principle that self-regulation involves two focuses: promotion and prevention.

Promotion focus is characterized by goals towards “accomplishments and aspirations” (1997)

and prevention focus is characterized by goals towards “safety and responsibilities” (1997).

Promotion focus orients towards a "state of eagerness" (Higgins, 1997) and involves "goals with a fulfillment of growth" (1997). Such orientation is theorized to "benefit from going beyond the concrete to the abstract or global”, and shows “sensitivity to positive outcomes” (1997).

Prevention focus orients towards “detailed concrete surroundings to maintain security and do so by screening the environment for possible impediments to fulfilling their goals to eliminate them” (Semin, et al, 2005).

Another component of regulatory focus is the idea of the focus matching its corresponding environment for enhanced performance and engagement (Higgins 1997). There is a regulatory fit when there is a match between the focus and its corresponding state (1997), and this fit also applies to the reward structure of the task they are performing (Keller & Bless, 2006). Because promotion focus shows “sensitivity to positive outcomes (Higgins, 1997), there is a regulatory match between promotion focus and tasks that involve gaining rewards, (such as earning points), and likewise for prevention focus that matches with tasks involving avoiding loss, (such as maintaining points from further loss). A regulatory mismatch occurs when the desired goal does not match the possible outcome state, and when there is a mismatch between the focus and the strategies used to pursue a goal (Higgins, 1997).

In general, regulatory fit has been found to enhance task engagement, (2000), and improved cognitive performance (Keller & Bless, 2006) compared to a regulatory mismatch with the environment or the task at hand. Few recent studies have so far found a link between regulatory

focus with regulatory fit and helping people attend to abstract versus concrete aspects of word and perceptual tasks. Semin et al conducted a study on regulatory focus and abstract thinking college students, and found that the participants were more likely to provide abstract descriptions when “framed with the communication goal of approach terms (promotion) than when framed in avoidance (prevention) terms, and were found to describe and use context-specific words and details when framed in avoidance terms” (2005). Förster and Dannenburg (2005) conducted a study examining regulatory focus on perceptual stimuli via the Navon Letters task, and found a slight positive association between promotion focus and identifying larger letters more quickly, as well as finding a positive association between prevention focus and identifying smaller letters within the larger letter more quickly (2005). They also found that by priming participants with local or global processing styles, global-primed participants assigned a higher value to the mug under the gains task, (promotion focus) as compared to the losses task, (prevention focus), (2005).

Theoretical and Practical Implications

Studies have shown that regulatory fit promotes the ability to make different levels of abstractions while regulatory mismatch negates the ability to do so. Currently there are two theories that influence different types of thinking. Higgins’ theory of regulatory focus posits that there are two types of regulatory focuses – promotion and prevention. Promotion focus is a type of motivation that encourages engagement behavior with a tendency for “growth behavior” – and this may explain why this type of focus can encourage more “creative thinking” (Higgins, 1997) and the ability to make broader abstractions across concepts (Förster & Dannenburg, 2005). Higgins’ theory of environment fit and mismatch also can enhance or decrease cognitive performance. Regulatory fit is when the regulatory focus is matched with the same environment,

and this enhances one's ability to make different types of abstractions, whereas a regulatory mismatch debilitates one's ability to do so. Together, these two theories predict that regulatory focus as well as environmental fit/mismatch can change the ability to make abstractions, or be able to identify a set of invariant central characteristics of a thing" (2013), which can then enable one's ability to generate creative ideas and inspiration.

While these studies offer a promising view on the role regulatory focus and fit may have on directing different levels of abstractions – few are available to confirm such a relationship. Therefore, more studies may be needed to closely assess and evaluate the relationship of how regulatory focus and fit can induce different levels of perceptual processing, as well as how regulatory focus, depending on fit, can enable one to abstract across psychological distances of different contexts, such as traversing from the conceptual to perceptual stimuli.

Study Overview

As this review demonstrates, the influence of regulatory focus on the ability to draw abstractions is still poorly understood with such few studies exploring this. The aim of this study is to clarify the effect of regulatory focus, or motivational type, on complex cognitive performances such as making abstractions. To study the different levels of abstractions being made under different motivational focuses, we used the Kimchi Palmer task, which is a classic hierarchical test to test attention on abstract or concrete visual features (1982).

The current study was a 2 (Regulatory type: Promotion vs. Prevention) x 2 (Abstraction level: Abstract vs. Concrete) between-subjects design. Participants were randomly assigned to one of the four conditions of interest. Participants first were induced with either of the two types of motivational focuses by reading a prompt before taking the computerized hierarchical task

that would include both abstract and concrete visual/conceptual questions along with a points meter that would track their progress throughout the test.

According to Higgins's theory of regulatory focus and fit – we hypothesized that the promotion focus group will score higher points on the abstract questions due to regulatory fit and score lower on the concrete questions due to regulatory mismatch, whereas the prevention focus group will lose less points on the concrete questions due to regulatory fit and lose more points on the abstract questions due to regulatory mismatch.

METHODS

Participants

Nine-seven undergraduates were recruited from the Introduction to Psychology participant pool at The University of Texas at Austin. The age range of the participants were between 18 to 23 years old ($M = 19.34$, $SD = 1.13$). The same consisted of 53.7% female and 47.3% male. The reported races were as follows: Caucasian: 62.22%, Asian: 24.04%, African American/Black: 12.42%, No Response: 1.32%. All participants were compensated with course credit upon completion of the experiment. Data from 5 participants were excluded from the analysis due to incomplete data. All recruitment and testing procedures were approved by the IRB at The University of Texas at Austin.

Materials

For the task design, a modified version of the Kimchi-Palmer task where the different regulatory focuses and fits were induced by manipulating a drawing ticket as the motivational reward as well as the sequencing of the target words and shapes presented. There were initially two groups based on the two different regulatory focuses: promotion focus participants X prevention focus participants who will also be assigned different manipulations of the drawing ticket as outlined below.

Pre-test Demographics Questionnaire

Before taking the computerized task, the participants were asked to report their age, sex, and level of education.

Hierarchical Visuals Task

The participants then proceeded with the hierarchical visuals task. The hierarchical visuals task was a perceptual test that was a modified version of the classic Kimchi-Palmer

where a correct target item was to be selected for from the two choices provided. This task was designed to measure the participants' regulatory focuses and fit with the different levels of perceptual abstractions as well as the ability to associate psychologically distant contexts of conceptual to perceptual stimuli through manipulated words and visual items. Whereas the original Kimchi-Palmer hypothetically had no right or wrong answer despite a given visual target, the visuals task would explicitly instruct the participant with a target word to choose the correct target shape from either of the two possible choices of that are either the global form or the local pattern of the target items described. The points gained/lost would be assigned to the correct selection made. By assigning points to be gained/lost, the induced regulatory focus on the participants could continue depending on the fit of the task rewards.

The words in the written instructions section was manipulated to measure the rate of associating words to visual stimuli depending on the regulatory focus and fit induced. The words, 'big' and 'far' were used interchangeably to reference the global visual shape, and the words 'small' and 'near' were used interchangeably to reference local, detailed visual items in the instructional target shape. Doing so assessed hierarchical processing under regulatory match versus mismatch based on the task goals at hand. For the Promotion Focus Type group with the match condition, the target was a global shape with the instruction words of "large" and "far". For the Promotion Focus Type group with a mismatch condition, the target was a local shape with the instruction words of "small" or "near". And likewise, for the Prevention Focus Type group with the match condition, the target was a local shape with the instruction words of "small" or "near", while the mismatch condition will be a global target with the instruction words of "large" and "far". Participants were told to answer each trial as fast as possible and a ticking time sound will be induced in the background throughout the task. Response time and

accuracy were measured for the respective match and mismatches of the two focus type groups to assess regulatory fit with the ability to make higher versus lower abstractions across the word and visual targets.

An allocated time of approximately 45 seconds was given to the participants designated by the computer to allow ample time for reading the instructional prompt. Once the timer on the computer would be up, the participant could click on the 'Next' button on the computer screen to proceed with the visuals task.

Design & Procedure

For this study, we used a 2 (Regulatory type: Promotion vs. Prevention) x 2 (Abstraction level: Abstract vs. Concrete) between-subjects design. Participants were randomly assigned to one of the four conditions of interest. The hierarchical visuals task consists of 20 total images that vary in sequence of the target words: small, near, big, far, being presented for each focus type group. For the points system of the promotion focus the points will be cumulative for both focus type groups to keep the participants continuously engaged with earning or maintaining enough points for the drawing ticket by having them perform at a 90% criterion (18 correct out of the 20 total trials).

There was a visual point meter on the computer screen to help the participants track their progress while they proceed with the task. For the Promotion Focus Type group, the point meter started at a 0 and was located at the bottom of the point meter, with the indicator of 14 points (90% criterion) as labeled as Bonus at the top of the meter. The region above the bonus line were labeled Yes, and the region below as No, to indicate that the bonus was earned when the point meter was above the line and was not earned below the line. The Prevention Focus Type group were told that they would lose the given ticket if they failed to lose less than 14 points (90%

criterion), would lose 1 point for every correct answer but lose 3 points for every incorrect answer. The point meter started at 0, but the 0 was located at the top of the point meter and the 90% criterion indicator of 14 will be labeled as Bonus towards the bottom of the point meter, and as in the Promotion Focus Type task, the word Yes were labeled above the Bonus line, and the word No labeled below. For every correct answer, there was a ‘cha-ching’ sound like that of a cash register, and the word ‘correct’ appeared on the computer screen. For every incorrect answer, there was a buzzer sound as well as the word ‘incorrect’ on the computer screen. At the end of the final block, both the different focus type groups’ participants were told whether they could gain or keep their ticket entry into the drawing.

The participants randomly assigned to either the Promotion or the Prevention Focus Type group. All participants read an informed consent that will contain deceptive information about the study’s purpose. This deception was necessary to protect against any biased response or behavior from the participants before they proceed with the study. The participants assigned to the Promotion Focus Type group were told before the study that they would have the opportunity to win a drawing ticket for a drawing to win \$50 if their performance exceeded a criterion, (or 90% accuracy). The Prevention Focus Type group was given a drawing ticket for the drawing at the door, but they were told that they could keep this ticket if their performance maintained a certain criterion, (90% accuracy), otherwise, they would lose it.

The participants assigned to the Promotion Focus Type group were told that they could win the drawing ticket if they were to gain 36 points or more over the course of 20 trials, and were also told that they would win 2 points for every correct answer and gain 0 points for an incorrect answer. They were also told that they had at least a 1 in 10 chance of winning the drawing if they won enough points for that entry.

The participants assigned to the Prevention Focus Type group were given a drawing ticket to the drawing of \$50 upon arrival, and were told that they would lose the entry if they failed to lose 14 or fewer points over the 20 trials. They were also told that they would lose 1 point for every correct answer and 3 points for every incorrect answer. And similarly, to the Promotion Focus Type group participants, the Prevention Focus Type group participants were told that they had at least a 1 in 10 chance of winning the drawing if they could keep the drawing ticket.

If there were any malfunctions in the computerized test or if they did not pass the pre-test, the participants were instructed to stop and exit out of the test. Following the test, the participants were then debriefed about the experimental manipulation. Since we used deception in this study, (i.e. the nature of this study and the framing of the motivational states), participants were given the opportunity to either allow us or not allow us to use their data. Once the participants were debriefed about the real purpose of the study, the participants were thanked and compensated with course credit a chance to win or a chance to keep a drawing ticket to win \$50 cash in a random drawing with a 1 in 10 chance of winning. The participants provided their email addresses, and using an online randomization tool – the winner(s) were notified via email after the study if they won the drawing. Otherwise, there would be no compensation other than course credit, in which they would receive 0.5 Sona credit.

RESULTS

For the study, we used a 2 (Regulatory type: Promotion vs. Prevention) x 2 (Abstraction level: Abstract vs. Concrete) between-subjects design to investigate the effects of regulatory focus and levels of abstractions on mean proportion correct, mean time spent(s) on the Kimchi Palmer task items. We were also interested in studying the influence of regulatory fit during the task. Since we had an unbalanced design, all ANOVAs were computer using Type III Sums of Squares. All post-hoc tests were corrected using Bonferroni correction.

Manipulation Check

Practice Performance

As a manipulation check, we wanted to ensure that both focus groups could understand and complete the hierarchical task and had them complete a practice test of 20 Kimchi Palmer visual hierarchical questions. As a pre-measure, we made sure that the performance between the two practice set groups exceeded at least 75% correct on this practice test. If the participant failed to get at least 75% of the practice questions correct, they were asked to leave the experiment.

Performance and Time-Spent Analysis

The mean proportion correct data was analyzed using a 2 (Motivation Type: Promotion vs. Prevention) x 2 (Abstraction Type: Abstract vs. Concrete) mixed model ANOVA with motivation type and abstraction type between-subjects design. The results showed that there was no main effect of Promotion vs. Prevention type performance, with the mean proportion correct for each of the two types of Abstraction types appearing to be non-significant, ($p > 0.24$), which indicated that there was no significance in 2-way interactions between the motivation type and abstraction type, ($p > 0.1$). There also appeared to be no main effect of abstraction-type,

participants appeared to spend around the same time, (in seconds), on the promotion, ($M = 23.4$, $SE = 0.87$) vs. prevention type questions, ($M = 24.2$, $SE = 0.91$) from both Promotion and Prevention-type focus groups.

Discussion

The purpose of the study was to examine the effects of regulatory focus and abstraction performance in a visual and conceptual task. We predicted that promotion focus would lead to better ability to make abstract abstractions since it is also according to respective environmental fit. Similarly, we also predicted that the prevention focus would lead to better ability to make concrete abstractions because this motivation type is also according to its respective environmental fit. Results showed that we did not find evidence that the framing of the different regulatory focuses was enough to affect the ability to make better abstractions of its corresponding levels. Thus, these results do not support our original hypotheses.

The current study used induced regulatory focus as our main manipulation. Given that the participants were told they either had the chance to win a lottery ticket or lose the lottery ticket to the cash prize drawing, perhaps future studies should utilize more salient rewards or consequences to induce these motivational types, such as actual cash prizes that they can earn or lose by the end of the experiment. If these motivational types are not being properly induced, the participants would less likely be stimulated to perceive the visual and conceptual stimuli's effectively. Future studies should also explore different types of stimuli's where abstractions may be more easily inferred. The conceptual use of associating words like: "far" and "large" with larger shapes instead of the smaller ones in the visual Kimchi Palmer task might be too far of a relational distance to make, especially for those whose motivational focus was not properly induced.

The present study clarified the role of manipulation focus and abstraction performance. While previous studies showed that promotion focus does enhance abstract abstraction abilities, the present research does not indicate so. However, the findings from the current study provides a framework for understanding how regulatory focus and abstraction performance interact. By understanding this interaction, we can apply our knowledge to both the academic and industrial level of scholars and designers, respectively, and explore possible relations between creative idea generation and motivation.

Figures

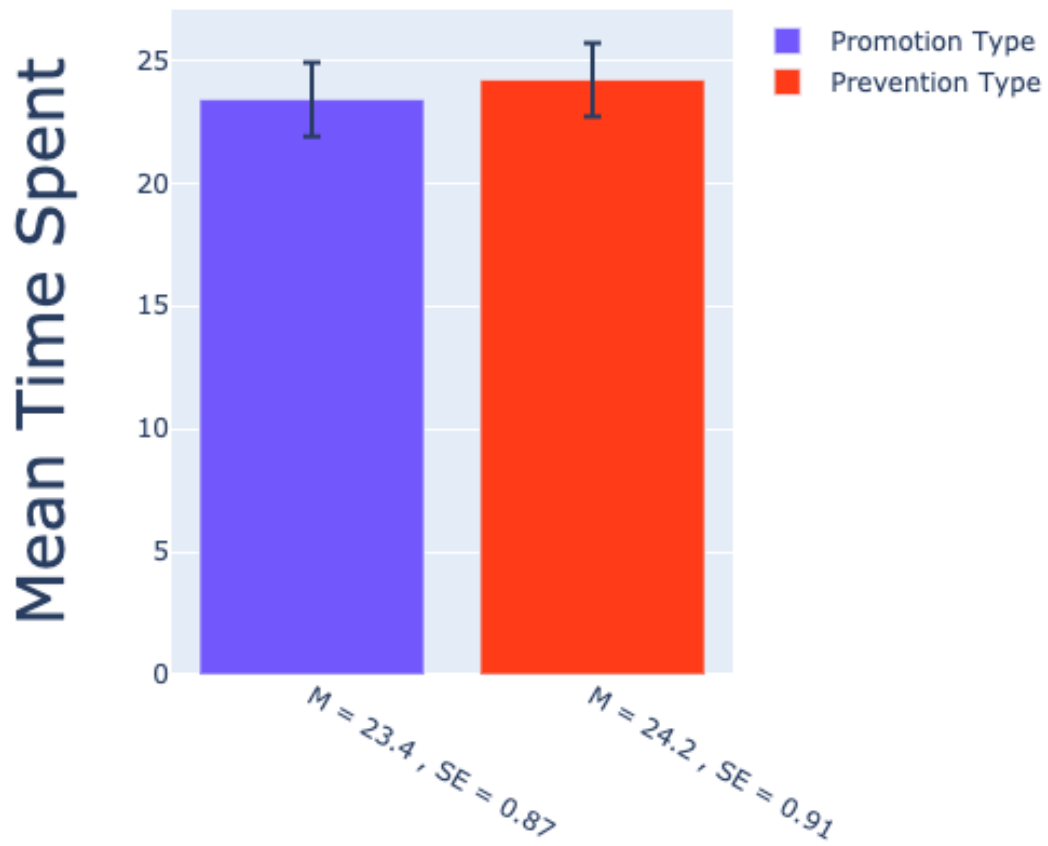


Figure 1. Mean time spent on task for each motivation type

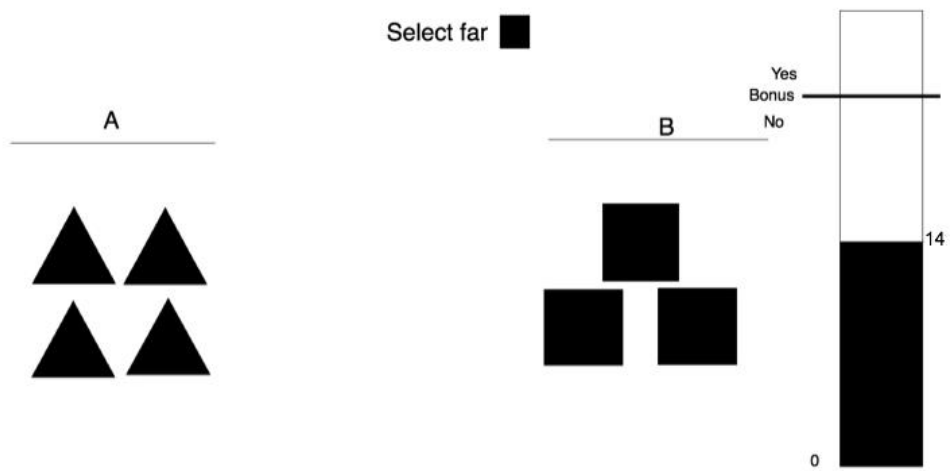


Figure 2. Visual example of an abstract task of abstracting global concept, “far” with image

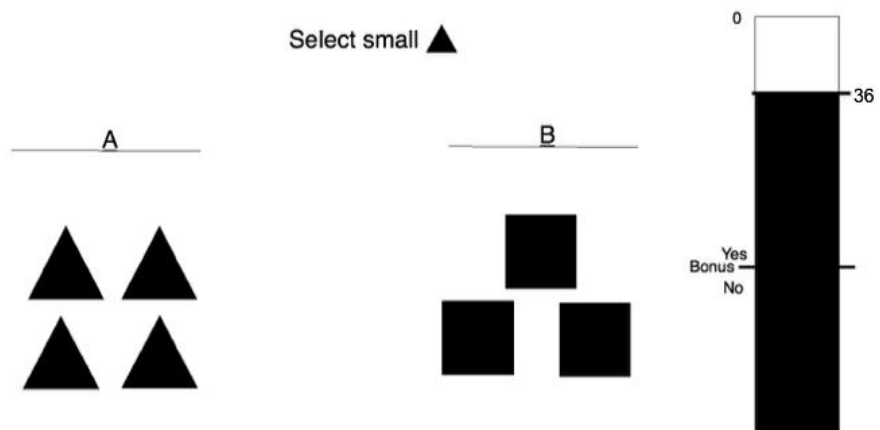


Figure 3. Visual example of a concrete task of abstracting local concept of “small” with image

References

- Arnheim, R., (1969). *Visual thinking*: University of California Press.
- Burgoon, E. M., Henderson, M. D., & Markman, A. B. (2013). There Are Many Ways to See the Forest for the Trees. *Perspectives on Psychological Science*, 8(5), 501-520.
- Förster, J., & Higgins, E. T. (2005). How Global Versus Local Perception Fits Regulatory Focus. *Psychological Science*, 16(8), 631-636.
- Higgins, E. t. (1997). Beyond pleasure and pain. *American Psychologist*, 52(12), 1280-1300.
- Higgins, E. T., Shah, J., & Friedman, R. (1997). Emotional responses to goal attainment: Strength of regulatory focus as moderator. *Journal of Personality and Social Psychology*, 72(3), 515-525.
- Keller, J., & Bless, H. (2006). Regulatory fit and cognitive performance: The interactive effect of chronic and situationally induced self-regulatory mechanisms on test performance. *European Journal of Social Psychology*, 36(3), 393-405
- Kimchi, R., & Palmer, S. E. (1982). Form and texture in hierarchically constructed patterns. *Journal of Experimental Psychology: Human Perception and Performance*, 8, 521-535.
- Langer, S. K. (1953). *An introduction to symbolic logic*. New York: Dover Publications.
- Maddox, W. T., Baldwin, G. C., & Markman, A. B. (2006). A test of the regulatory fit hypothesis on perceptual classification learning. *Memory and Cognition*, 34, 1377-1397.
- Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology*, 9, 353-383
- Semin, G. R., Higgins, T., Montes, L. G., Estourget, Y., & Valencia, J. F. (2005). Linguistic Signatures of Regulatory Focus: How Abstraction Fits Promotion More Than Prevention. *Journal of Personality and Social Psychology*, 89(1), 36-45.

Shah, J., Higgins, E. T., & Friedman, R. S. (1998). Performance incentives and means: How regulatory focus influences goal attainment. *Journal of Personality and Social Psychology*, 74, 285-293.

Smith, E. E., Shoben, E. J., & Rips, L. J. (1974). Structure and process in semantic memory: A featural model for semantic decisions. *Psychological Review*, 81, 214-241.

Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, 117, 440-463.