

The Effect of the Nature and Perceived Validity of Zodiac Personality Predictions on Logic Test Performance

Rebecca L. Brown, Moira E. Kisch, Maria R. Miller, Nicole M. Pacera, Rebecca M. Perrottet, and Jennifer L. Stevenson

Ursinus College

Abstract

This study investigated the effect of priming on puzzle performance in 49 students. Subjects were given fictitious Chinese Zodiac personality descriptions and asked to complete a Sudoku puzzle. Descriptions were manipulated based on nature (positive or negative) and perceived validity (valid or not valid) of description. Subjects read fictitious research statistics that either supported or refuted the validity Chinese Zodiac Animal Signs in order to manipulate perceived validity. It was hypothesized that participants who received the positive/valid horoscope and negative/invalid horoscope predictions would perform best. Findings supported previous literature that priming subjects to think a certain way can affect behavior (Gramzow, Johnson, & Willard, 2014). Subjects primed to think positively about themselves performed better than those primed to think negatively about themselves. Additionally, perceived validity of horoscope predictions had no effect on performance. This study also discovered a marginally significant trend for participants to reject information that negatively affected their self-perceptions. This research expands upon existing knowledge on priming of positive or negative personality traits in order to fully understand its effect on performance.

Key Words:

priming, validity, horoscope, Chinese Zodiac, self-perception

In the United States an estimated 90% of newspapers contain horoscopes and 30-60% of readers admit to believing in astrology (Fichten & Sunerton, 1983). Reading astrological predictions provides insight into one's personality traits and skills based simply on date of birth. However many studies have shown that astrology has no scientific basis (Fichten & Sunerton, 1983; Crowe, 1990; Dean and Kelly, 2003). For instance, a meta-analysis by Crowe (1990) of over 40 controlled studies indicated that astrologers were unable to predict personality more accurately than by simple chance, and that people born less than five minutes apart had no similarities in personality.

Despite the lack of scientific support, many people continue to read and trust in astrological predictions. In fact, studies have shown that some people even make decisions based on their horoscopes (Snyder, 1974). The

influence of astrological predictions may be an instance of the Barnum effect: the tendency for people to rate sets of generic statements that could apply to many people as accurate to them personally. In a classic experiment, Forer (1949) found psychology students rated generic descriptions as accurately describing their true personalities (mean rating was 4.26 out of 5). Countless studies have repeated Forer's (1949) original experiment, supporting the conclusion of the Barnum effect, that people readily accept vague or trivial personality statements (e.g., Allum, 2011; Rogers & Soule, 2009). In fact, Barnum acceptance has been found to be higher for subjects who have external locus of control and lower self-esteem (Rogers & Soule, 2009). Belief and trust in these predictions can have powerful influences on behavior.

Perhaps the true influence of astrology lies in the power of suggestion. Being told we are

or are not a certain way can have powerful effects on behavior. Priming can influence people's self-perceptions, leading them to act and interpret what they experience according to the traits activated by priming techniques. This operates at least in part through the self-fulfilling prophecy, the idea that one's expectations about circumstances, events or others can affect behavior in a way that cause those expectations to come true (Lang, 2010). Often, when people are told they are a certain way they behave in congruence with that expectation.

The power of priming can be utilized in both a positive or negative way. Previous studies have shown the benefit of priming as evinced by boosts in academic performance, decreased test taking anxiety, and improved memory (Gramzow et al., 2014; Lang, 2010; Tulving, Schacter, & Stark, 1982). For example, a study that primed students by asking them to state their goal GPAs, found those who were primed with an achievement goal gained higher GPAs the following semester than those who were not primed (Gramzow et al., 2014). Priming subjects to describe someone successful before completing an intelligence test has been shown to decrease test anxiety and improve performance (Lang, 2010).

Additional studies further illustrate the potential benefits of priming positive stereotypes such as increased performance on trivia games and memory tests (Dijksterhuis & Knippenberg, 1998; Lin, Kennette, Havermaet, Frank, & McIntyre, 2011). One study primed subjects by asking them to imagine a typical professor by listing the behaviors, lifestyle, and appearance. After priming, subjects were given questions from the game Trivial Pursuit. Participants primed with the professor stereotype performed significantly better than the control (Dijksterhuis & Knippenberg, 1998). Even when subjects are not a member of a group themselves, priming them to think about that social category can influence them to behave in ways consistent with the target group. For instance, social groups like Asians are perceived to have high intellectual capabilities, while social groups like the elderly are associated with lower intelligence and memory loss. A study by Lin et

al. (2011) indicated that priming with Asian relevant words compared to priming with elderly related or neural words increased cognitive performance and memory. This illustrates how being primed with a group believed to have high intellectual capabilities can boost performance.

Unfortunately priming does not always have positive effects; sometimes expectations from others can influence behavior in a negative way. This danger has been demonstrated by stereotype threat, the idea that when subjects are reminded of a stereotype associated with the group to which they belong, they are more at risk to conform to the stereotype of the group. Many studies have shown the negative effects of priming for racial stereotypes (Steele, 1997; Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Roberson, Deitch, Brief, Block, 2003). Even the most subtle priming, such as checking a box for race on a demographic survey, can be detrimental to success (Steele, 1997). When researchers gave a verbal exam to black and white Stanford University students, black participants scored higher than the white participants when there was no race prime. However when subjects were primed to indicate their race on a demographic questionnaire, black participants did worse than whites. What is most alarming is that this procedure is actually very common in standardized tests. Furthermore, racial stereotype threat has been demonstrated in the workplace. One study indicated that African Americans who had "solo status," meaning they were the only African Americans in their workplace, demonstrated increased stereotype threat (Roberson et al., 2003).

In addition to racial primes, priming with gender stereotypes can also have negative effects. For example, this threat has been demonstrated in regard to the stereotype that women are bad at math (e.g., Steele, 1997). Women who were primed to think a math test produced gender differences scored significantly worse on the math exam than women who were not primed about gender differences on the test. Moreover, when women were not primed about the gender difference they performed almost equally to males. This illustrates the power of

expectation. Prior to activation of the stereotype threat, female subjects showed absolutely no doubt in their abilities, in fact they thought they were good at math. However, a simple reminder of this stereotype was enough to negatively impact performance.

Similar to gender and racial stereotypes, Chinese Zodiac animals signs contend that people possess certain personality traits and skills based on a group to which they belong (in this case the animal character of the year they were born under). Much research has been conducted on the self-fulfilling prophecy and stereotype threat (Steele, 1997; Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Roberson, Deitch, Brief, Block, 2003). However, little research has explored the influence of zodiac predictions on behavior. Many people read and trust in the predictions given by their zodiac sign. Perhaps reading the zodiac description would influence one's beliefs enough to change how he or she behaves.

Previous studies indicate that several factors influence belief in astrology such as nature of the description and validity (Glick, Gottesman, and Jolton, 1989; Borestein, 1996; Fichten & Sunerton, 1983). For example, one study found that subjects were most likely to believe astrological predictions to be true if they provided positive as opposed to negative descriptions (Glick, 1989). Response to zodiac predictions is also influenced by perception of validity, in other words, how seriously the reader takes the prediction (Borestein, 1996; Fichten & Sunerton, 1983). Previous research has shown that there is a positive relationship between perceived validity and participants' general test-taking attitudes and respondent motivation (Bornstein, 1996). However, little to no research has examined the effect of perceived validity on stereotype threat. Perhaps the stereotype threat can be negated or enhanced depending upon whether subjects are told zodiac personality predictions are valid or invalid.

Moreover, one's belief in astrological predictions is subject to several biases. For most individuals, self-concept and self-esteem play an incredibly large role in our lives, as we oftentimes allow how we see ourselves to affect

the way we act in everyday situations. Due to the greater meaning of self-esteem, individuals have the tendency to protect their self-concept through various ways, such as self-serving biases and self-verification.

According to Hippel, Shakarchi and Lakin (2003) individuals oftentimes associate themselves with desirable outcomes and stay away from undesirable outcomes. In Hippel, Shakarchi and Lakin (2003)'s study, they found that when participants did well on a task, they tended to rate the task as more important and were more likely to cheat, but only when they could claim the cheating was unintentional. The results of this study align with the theory that self-serving biases have a self-deceptive component, and thus people will oftentimes lie to themselves in order to maintain their self-concept.

Similarly to self-serving biases, self-verification operates on the principle that individuals seek information that verifies their beliefs about themselves (Swann, 1997). Swann and Ely (1984) found that self-verification always occurred when participants had a concrete sense of self-concept. Additionally, self-verification occurred when both perceivers and targets were unsure of their beliefs. This study indicated that when people are relatively sure of their self-perception, they always behaved in ways consistent with this self-belief. However, for individuals who are relatively unsure of their self-perception, they behaved in ways that were self-consistent only when perceivers were unsure of their expectancies.

Lillqvist and Lindman (1998) further investigated the effects of self-verification within the context of academics and the effect that belief in astrology had in self-verification. They found that not only did exposure to astrology related information verify self-concept, but that astrology was appealing in ambiguous or uncertain situations and astrological information verified an individual's self-beliefs and could potentially reduce negative feelings of uncertainty.

The current study was based on the idea that astrological predictions could act as primes. By telling subjects characteristics about their

personality and skills, astrological predictions could change the way they think about themselves, potentially altering behavior. Two factors that might influence participants' response to zodiac predictions: nature of the description (positive versus negative skills) and perceived validity of the description were examined. More specifically, fictitious Chinese Zodiac descriptions were manipulated on the nature of the description (good versus poor logic skills) and the perceived validity of the zodiac descriptions (research supporting or negating the accuracy of the Chinese zodiac). After priming subjects with zodiac descriptions they were asked to complete a Sudoku logic puzzle. Consistent with previous research on the self-fulfilling prophecy, it was hypothesized that subjects would perform according to how they were primed to think about themselves. More specifically, participants told they are poor on logic tests would do worse than participants told they are good at logic tests.

Method

Participants

Forty-nine undergraduate students between the ages of 18 and 21 years ($M = 19.12$, $SD = 0.95$) enrolled in an introductory Psychology course at Ursinus College participated in this study. Participants were offered extra credit as compensation for participating in the study. Eighteen first year students, 22 Sophomores, 6 Juniors, and 3 Seniors took part in the study. Of the participants 14 were male and 35 were female, and the majority of individuals (65%) defined themselves as Caucasian.

Measures

Participants were asked to complete a medium level Sudoku puzzle, a logic based number puzzle that involves filling in a 9x9 grid of squares so that every row, column, and 3x3 box contains the numbers one through nine (GameHouse, 2013). Puzzles were scored based on the number of boxes filled in correctly, and participants were given 6 minutes to complete

the Sudoku puzzle. Participants were also given a demographic survey to complete that asked several questions including age, gender, race, and their familiarity with Sudoku puzzles and Chinese Zodiac horoscopes.

Procedures

Participants were called to the front of a classroom by birth year so that they could be given the appropriate description of their Chinese Zodiac. Participants believed that they were receiving a description unique to their individual birth year, but they actually received a fictitious horoscope description. Subjects were asked not to talk once the descriptions were given in order to prevent them from figuring out the intention of the study (e.g., that all of the horoscope descriptions said the same thing).

Horoscopes were manipulated based on four conditions: positive-valid, negative-valid, positive-not valid, and negative-not-valid. Positive Zodiac descriptions gave complimentary descriptions of skill and personality, especially those related to logic and reasoning. Negative Zodiac descriptions emphasized negative characteristics and weaknesses related to logic and reasoning skills. Validity of the horoscopes was also manipulated. Subjects in the valid group read fictitious research results that supported the accuracy of Chinese Zodiac Animal Signs, and subjects in the non-valid group read fictitious research results that did not support the accuracy of Zodiac signs. Subjects were randomly assigned to each of the four conditions.

After allowing the participants enough time to read the Chinese Zodiac descriptions, subjects were given 6 minutes to solve a medium level Sudoku puzzle. After attempting to complete the Sudoku puzzle in the allotted amount of time, participants were given a questionnaire that asked several demographic questions. The questionnaire also included a manipulation check to confirm they actually read the horoscope (e.g., "Which of the following characteristics was present in your horoscope?"). Participants were debriefed at the conclusion of the study. Participants were told that the Zodiac descriptions given were fictitious

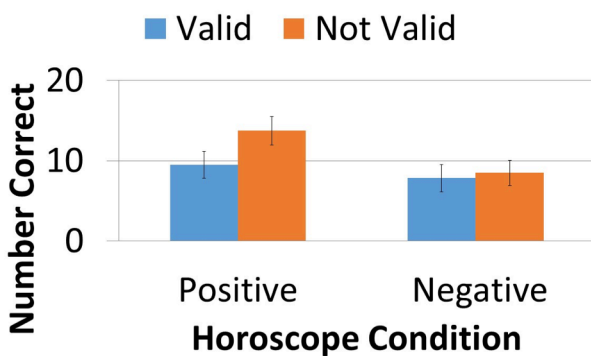
and that the purpose of the study was to see if Zodiac descriptions based on logic and reasoning affected performance on a Sudoku puzzle. The entire study took approximately 20 minutes to complete.

Results

To test if familiarity had an effect on performance, an independent-groups t-test was conducted comparing novices to subjects who were more familiar with Sudoku. There was no difference in Sudoku performance between subjects who were familiar with Sudoku puzzles ($M = 8.45, SD = 6.86$) and subjects who were not familiar with Sudoku puzzles ($M = 10.66, SD = 5.44$), $t(47) = -1.25, p = .22$. This confirms that the performance task was appropriate for novices.

To investigate our hypothesis that positive horoscope predictions would result in better performance on Sudoku puzzles, a 2 (horoscope description) x 2 (validity) independent-measures analysis of variance (ANOVA) was conducted. Results revealed a significant main effect of horoscope description on Sudoku performance, with subjects in the positive description condition performing better than those in the negative description condition, $F(1,45) = 4.19, p = .05$. Results indicated no main effect of validity, $F(1,45) = 2.11, p = .15$; and no significant interaction between horoscope description and validity, $F(1,45) = 1.12, p = .30$ (see Figure 1).

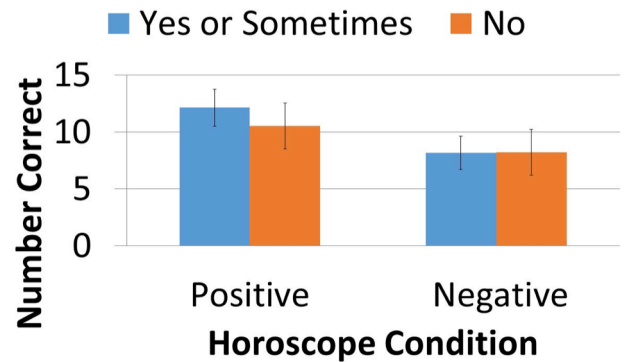
Figure 1



Average number of boxes correct on Sudoku puzzle for each horoscope condition. Subjects with positive horoscope descriptions had more boxes correct than subjects with negative horoscope descriptions. No difference in Sudoku performance was found for

To explore whether degree of belief in horoscope had an effect on performance, belief in horoscope was transformed into a new variable with two levels (i.e., yes/sometimes or no). Belief was examined as a 2-level, as opposed to a 3-level variable, due to a low n in the “yes” category. Therefore, “yes” and “sometimes” responses were combined into one category. A 2 (horoscope description) x 2 (belief) independent-measures ANOVA revealed no main effect of degree of belief in horoscopes on Sudoku performance, $F(1,45) = 0.19, p = .67$. There was a marginally significant effect of horoscope description on Sudoku performance, $F(1,45) = 3.09, p = .09$. Again, subjects in the positive description condition performed better than those in the negative description condition. Furthermore, there was no significant interaction between horoscope description and degree of belief in horoscope, $F(1,45) = 0.21, p = .65$ (see Figure 2). Note, due to sample size constraints, it was not possible to conduct a 2 (horoscope description) x 2 (validity) x 2 (belief) independent-measures ANOVA. To explore whether participants paid attention to the traits

Figure 2.

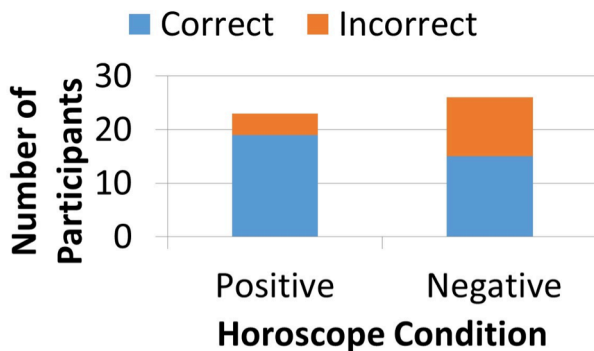


Average number of boxes correct on Sudoku puzzle by self-reported degree of belief in horoscopes. Degree of belief in horoscopes had no effect on performance. Error bars represent 1 SE.

in their horoscope, they were asked to mark which characteristics were in their description. A chi-square analysis was conducted to compare the proportion of correct observations for each horoscope condition (positive or negative). A marginally significant trend was found such that participants were more likely to answer the observation check question incorrectly if their

horoscope description contained negative rather than positive characteristics, $\chi^2(1) = 3.57, p = .06$. Only 17% of participants with positive descriptions answered the observation check incorrectly, whereas 42% of participants with negative descriptions answered incorrectly (see Figure 3).

Figure 3.



Accuracy of participants' response to "What characteristics were present in your Chinese Zodiac description" by horoscope condition. Participants with negative descriptions tended to be more likely to answer incorrectly.

Discussion

The purpose of the current study was to examine two factors that might influence participants' performance on Sudoku puzzles: nature of the description and perceived validity of horoscope predictions read before completing the study. Being familiar or not familiar with a Sudoku puzzle had no effect on performance suggesting that the Sudoku puzzle was appropriate for both novices and experienced participants.

It was hypothesized that participants primed with positive horoscope descriptions would perform better on the Sudoku puzzle and that those who were given a validated description would internalize these traits more, and therefore also perform better on the puzzle. Results indicated that the presence of positive or negative characteristics in the description had a significant effect on performance, where participants primed to think positively about themselves (strong in logic and reasoning) performed better on the Sudoku puzzle than

those primed to think negatively about themselves. These findings are consistent with previous research illustrating that priming participants to think positively about themselves can be used to boost performance (Gramzow, Johnson, & Willard, 2014; Lin et al., 2012). Gramzow et al. (2014) used priming words that were related to achievement or competence in order to induce better performance. This is similar to this current research that used either positive or negative descriptions that included characteristic traits, like whether the participant was good or bad at logic tests. In this study, manipulating the presence of positive or negative skills in Chinese Zodiac personality descriptions was shown to be an effective priming technique. Therefore, positive self-perceptions led to better scores.

The exploration of the hypothesis in regard to how the manipulated validity of the descriptions influenced performance revealed no effect even though past research suggests that there is a relation between perceived validity and what motivates participants to answer test questions in certain ways (Borstein, 1996). It is possible that validity did not affect performance because participants did not believe the statistic given on the zodiac description. It might have been too obvious a manipulation as we stated that the horoscopes were 95% accurate or only 20% accurate. Another reason for the insignificant results may be because participants either believe the horoscopes are accurate or they do not, and a few sentences about validity will not change the minds of the participants. Moreover, the degree of belief in horoscope had no effect on performance, and the positive or negative primes outweighed whether the individual believed in horoscopes before participating in the experiment. Therefore, an attempt to convince the participants that the Chinese horoscopes were valid or invalid would be ineffective. This aspect was unique to the current research because there has not been a large amount of research conducted in this area. It would be interesting to continue to investigate if validity truly does influence how people perceive traits they are primed with by using more realistic and believable statistics.

Although we cannot conclusively say that participants were more likely to pay attention and remember the positive descriptions compared to those with the negative descriptions, there is a marginally significant trend that suggests this to be the case. This finding is interesting because it suggests a self-serving bias, or the tendency for individuals to reject negative feedback and accept positive feedback. Perhaps this tendency served as a way to protect self-esteem after reading negative Chinese zodiac descriptions. This trend is related to research conducted by Glick, Gottesman, & Jolton (1989), whose results suggested that both participants who were believers and skeptics of astrological descriptions were more likely to perceive favorable descriptions as more accurate. The present study expanded upon these findings by illustrating that not only can this self-serving bias impact belief in horoscopes, it can also impact subsequent behavior and performance. Additionally, this trend is related to research involving the Barnum effect. Previous research, like that conducted by Snyder, Shenkel and Lowery (1977), has shown that people are likely to accept ambiguous and vague personality descriptions, which could have possibly had an impact on the findings of this study because the horoscope descriptions were vague enough to be applied to a variety of individuals. Future research should investigate the marginally significant trend by using a larger sample size and a larger age range between the participants in order to see if the marginally significant trend will become significant. A variety of participants, not just college students, should be used in order to see if different age groups answer the manipulation check question differently when receiving a negative horoscope description.

Results from the current study suggest some significant findings, but there were several limitations to this study. It is worth noting that this experiment was the last of three separate studies offered to students for extra credit in a single evening. Therefore, it is possible that the participants completed the study quickly to be able to leave. Rushing could have negatively impacted Sudoku performance. Additionally, it is

possible that participants shared answers with their classmates during the Sudoku portion of the study, elevating test scores and impacting the effect of the personality descriptions. In the future, participants should only complete one study on a given night and should sit farther apart from other participants in order to avoid these limitations. Furthermore, the current study had a small sample size at a small liberal arts college, so future research is necessary to see if the results are generalizable to individuals outside of this community. To further see if these findings can be generalizable to the population and other settings, the characteristics that were primed could be changed because the majority of adults are no longer in school and are not concerned with test performance. Therefore, the horoscope descriptions should also be modified to reflect concerns of other adults, such as parenting ability or marriages, in order to see if adults participating in this study would be influenced by the positive and negative primes. Moreover, a relatively large amount of participants answered the manipulation check question incorrectly, that shows that many participants did not even notice the presence of the positive or negative skills in their Chinese Zodiac descriptions. This might be because the manipulation check was given after participants took the performance test. Perhaps placing the observation check question right after the Chinese Zodiac personality descriptions and the validity statistics but before the Sudoku puzzle would make this manipulation more noticeable. Finally, the current study focused on the short-term effects of positive and negative priming, and research shows that there is a relationship between priming and long-term effects (Gramzow et al., 2014). To investigate this further, a study could focus on the long-term effects of priming by testing the same participants over the course of months or years to see if positive and negative primes affect test performance over a long period of time.

Conclusion

Although further research is necessary to fully investigate the effects of priming on

performance, this current research is in agreement with past literature that positive priming traits lead to better test performance (Dijksterhuis & Knippenberg, 1998; Gramzow & Johnson, 2014; Lang & Lang, 2010; Tulving & Schacter, 1982; Major, Spencer, Schmader, Wolfe, & Crocker, 1998). The use of Chinese Zodiac personality descriptions was not only unique to this study but was also an effective priming technique suggesting that reading horoscopes can influence self-perception in a way that causes individuals to behave consistently with how they were primed to think about themselves. Additionally, many people regularly read and trust their horoscopes, so it is possible that horoscopes are just an effective way of convincing individuals to believe certain things about themselves, which in turn causes them to behave consistently with the descriptions. Furthermore, the trend for participants to reject negative information suggests a self-serving bias in participants. Therefore, future research should explore this question with adequate power (e.g., larger sample size) to detect this possible effect.

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