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Susceptibility to anchoring effects: How openness-to-experience influences responses to anchoring cues

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Abstract

Previous research on anchoring has shown this heuristic to be a very robust psychological phenomenon ubiquitous across many domains of human judgment and decision-making. Despite the prevalence of anchoring effects, researchers have only recently begun to investigate the underlying factors responsible for how and in what ways a person is susceptible to them. This paper examines how one such factor, the Big-Five personality trait of openness-to-experience, influences the effect of previously presented anchors on participants' judgments. Our findings indicate that participants high in openness-to-experience were significantly more influenced by anchoring cues relative to participants low in this trait. These findings were consistent across two different types of anchoring tasks providing convergent evidence for our hypothesis.

Keywords: anchoring, openness, personality, judgment, Big-5.

1 Introduction

The anchoring effect (e.g., Lichtenstein & Slovic, 1971; Tversky & Kahneman, 1974; Wilson, Houston, Etling, & Brekke, 1996) refers to the adjustment of one's assessment, higher or lower, based upon previously presented external information or an "anchor." The anchoring heuristic appears to be prevalent throughout human decision processes and has been shown to reliably influence judgments in a variety of domains including probability estimates (Plous, 1989; Tversky n& Kahneman, 1974), negotiation (Neale & Bazerman, 1991; Ritov, 1996), legal judgments (Chapman & Bornstein, 1996), and general knowledge (Chapman & Johnson, 1999; Jacowitz & Kahnman, 1995; Wilson, Houston, Etling, & Brekke, 1996). Further, anchoring effects appear viable across most situations for both novices and experts (Northcraft & Neale, 1987) and seem to be effective under conditions of monetary incentives (Chapman & Johnson, 1999; Wilson, Houston, Etling, & Brekke, 1996; Wright & Anderson, 1989) and in real-world settings (Northcraft & Neale, 1987; Cervone & Peak, 1986).

Anchoring thus appears to be a very robust psychological phenomenon. However, not all individuals may be equally influenced by anchoring cues. Identification of factors that influence how and in what ways a person is susceptible to this heuristic should further the understanding of the process. One avenue of approach is to investigate the role of individual difference factors.

Tversky and Kahneman (1981) pointed to the important role of "personal characteristics" of the decision maker in risky choice situations. Later work by Stanovich and West (1998; 2000) suggested that intellectual traits influence decision making and consequential choice preference. Recently, individual differences have been found in numerical reliance (Bartels, 2006; McElroy & Seta, 2003; Peters, Vastfall, & Slovic, 2006; Simon, Fagley, & Halleran, 2004), ambiguity (Lauriola & Levin, 2001; Nowlis, Kahn, & Dhar, 2002), preference for actions or inactions (Baron & Ritov, 2004) and the optimistic bias (Buehler & Griffin, 2003). The Big-Five personality traits (Lauriola & Levin, 2001; Levin, Gaeth, & Schreiber, 2002) have proven to be important individual difference factors for understanding decision choices. Further, attesting to the importance of individual differences, Levin and Hart (2003) demonstrated that individual differences in preference appear to originate at a very early age. Taken together, these findings suggest that the impact of individual difference factors on decision-making is both profound and pervasive.

The purpose of the current study is to investigate how one individual difference factor may influence the strength of the anchoring effect. Specifically, we are interested in how individual differences in the personality trait of openness-to-experience influences anchoring effects.

Openness-to-experience. In the last couple of decades the five-factor model of personality has become the most

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widely tested and well-regarded personality trait model. A great deal of research has supported this model's validity and reliability (Goldberg, 1981; John, 1990; McCrae & Costa, 1987). While most research has agreed on the nature of the first four factors, the nature of the fifth factor has been controversial; a controversy predominately based upon whether a lexical approach, derived from language frequency within the lexicon of a particular language (Saucier & Goldberg, 1996), or a questionnaire approach (McCrae & Costa, 1997) should be used to measure it.

The fifth factor is often labeled openness-to-experience, which refers to a propensity to adjust beliefs and behaviors when exposed to new types of information or ideas (John, 1990). Individuals scoring high on this dimension are more open to new ideas (McCrae, 1987) and motivated to seek variety and external experience. Individuals scoring low tend to be less inclined to consider alternative opinions and are more steadfast in their own beliefs (John, 1990) making them more likely to rely upon information that is familiar and conventional (McCrae & Costa, 1997).

A fundamental aspect of the anchoring effect is that individuals are sensitive to information which they have experienced. This change in judgment, which is based upon external cues, seems particularly relevant and related to the openness-to-experience personality trait. Specifically, as research has shown, the openness trait reflects individual propensities to "adjust" one's beliefs (John, 1990) and to consider external information (McCrae, 1987).

Therefore, based upon the nature of the openness-to-experience trait and the processes involved in the anchoring effect, we hypothesize that individual differences in openness-to-experience will influence susceptibility to anchoring effects. Specifically, we hypothesize that the judgments of those individuals high in this trait will be more influenced by previously presented anchors whereas those individuals low in this trait will be less influenced by the anchor. To test this hypothesis, we first measured individual levels of the personality trait of openness-to-experience. We then provided participants with an anchoring task involving either the Mississippi river (Study 1) or African nations in the UN (Study 2).

2 Experiment 1

2.1 Method

2.1.1 Participants and design

We distributed questionnaires to a sample of 197 undergraduate students at Appalachian State University[1]. The design of our study included the observed variable of openness-to-experience and our manipulated variable of anchor (high, low). Participants' estimates of the length of the Mississippi river served as our dependent variable.

2.1.2 Procedure and materials

All participants were first informed about the nature of our study. After consenting to take part in the study, participants were presented with the ten-item personality inventory, otherwise known as TIPI (Gosling, Rentfrow, & Swann, 2003). The TIPI contains two separate items that address each of the Big-Five factors (e.g., extraverted, self-disciplined, anxious, warm, calm, uncreative). In this scale, participants are asked to rate the extent that they feel each of the traits applies to them. All responses to these items were made on a 7-point scale. This measure was utilized because of its accuracy and brevity in assessing individual differences pertaining to the Five-Factor Model. Despite having somewhat diminished psychometric properties due to its truncated length, the TIPI has nonetheless shown adequate test-retest reliability. Furthermore, research has demonstrated that the TIPI has convergence validity with widely used Big-Five measures and convergence between self and observer ratings (Gosling, Rentfrow, & Swann, 2003).

After completing the TIPI scale, participants were presented with a traditional anchoring task involving the Mississippi river (Jacowitz & Kahneman, 1995). In this task, participants were first asked to estimate whether the length of the Mississippi river is more or less than 200 or 20,000 miles; this initial activity serves as the "anchor". Participants were then asked to estimate the exact length of the Mississippi river. All participants were then informed about the nature of our study, thanked, and released from the study.

2.2 Results

In order to investigate whether the personality factor of openness-to-experience influenced participants' susceptibility to the anchor, we performed a regression analysis with anchor (high, low) and participants' openness-to-experience scores serving as our independent variables. Participants' estimates of the length of the Mississippi river acted as the dependent variable. This analysis revealed a significant interaction ($F(1, 191) = 7.72$, $p < .007$) indicating a greater anchoring effect for greater levels of openness-to-experience (see Table 1). In the high

[1] Two participants were excluded from our analysis because their "estimates" were extremely high and were more than 3 standard deviations from the mean. Statistically significant results were still obtained when these participants were included in our analysis, however, we did not feel that it was representative of our findings. One participant was not included in our analysis because they did not complete the questionnaire.

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Table 1: Average Mississippi river length estimate as a function of openness to experience and anchor.

	Anchor					
	High			Low		
Openness	N	Mean	Std. error	N	Mean	Std. error
High	50	10,021.26	1360.36	68	698.50	82.01
Low	47	6,876.02	1204.82	30	1,372.00	606.04

anchor condition, participants level of openness had a significant effect on their estimates (F (1, 95) = 4.9, $p <$ .03) such that, higher levels of openness were associated with higher estimates. In the low anchor condition we again found significant results for openness and participants estimates (F (1, 96) = 11.25, $p <$ .002), indicating that higher levels of openness were associated with lower estimates.

We also wanted to examine whether any of the other Big-Five personality traits may have an influence on susceptibility to anchoring cues. In order to investigate this, we performed a regression analysis with each of the remaining four trait scores and anchor as independent variables and participants' estimates of the length of the Mississippi river as the dependent variable. These analyses revealed no significant interaction effects for any of the remaining Big-Five traits: extraversion (F (1, 191) = 1.97, $p >$ .16), agreeableness (F (1, 191) = 1.0, $p >$ .3), conscientiousness (F (1, 191) = .4, $p >$ .5) and emotional stability (F (1, 191) = .85, $p >$ .36).

3 Experiment 2

Study 2 was designed to test for a conceptual replication of our findings involving the openness trait and its influence on anchoring effects. In Study 1 we used the traditional Mississippi river anchoring task, however, in Study 2 we wanted to examine our hypothesis using a different scenario. Therefore, in this experiment we used an anchoring task involving the percentage of African nations in the United Nations.

3.1 Participants and design

We distributed questionnaires to 200 undergraduate psychology students at Appalachian State University[2]. Similar to Study 1, the design of our experiment included the independent variables of participants' level of openness-to-experience and anchor (high, low). Participants' estimates of the percentage of African nations in the United Nations served as our dependent variable.

3.1.1 Procedure and materials

After consenting to take part in our study, participants were first presented with the TIPI Big-Five personality scale. After completing the scale, participants were presented with our anchoring task (Tversky & Kahneman, 1974). In this task, we first asked participants whether the percentage of African nations that are members of the United Nations is more or less than 85 (high anchor condition) or 25 (low anchor condition). We then asked participants to estimate the exact percentage of African nations.

3.2 Results

As was the case in Study 1, we wanted to examine whether high and low openness-to-experience participants differed in their susceptibility to anchors. To do so, we performed a regression analysis with participants' openness scores and anchor as our independent variables and participants' estimates of percentage of African nations in the UN as our dependent variable.

Similar to Study 1, we found a significant interaction between openness scores and anchor (F (1, 195) = 4.95, $p <$ .03) again, indicating greater anchoring effects for greater levels of openness (see Table 2). Further analysis revealed that, in the high anchor condition, participants level of openness was significantly related to their estimates (F (1, 97) = 9.77, $p <$ .003) with greater openness scores associated with greater estimates. In the low anchor condition however, no significant relationship was found between openness and participants estimates (F (1, 98) = .03, $p >$ .8).

As was the case in Study 1, we also wanted to examine whether any of the remaining Big-Five personality traits may be influencing susceptibility to anchoring cues. Therefore, we again performed separate regression analyses with the remaining Big-Five personality traits and anchor cue acting as independent variables and estimates of

[2] One participant in our study failed to provide an estimate and was not included in our analysis of the data.

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Table 2: Average African nation percentage estimate as a function of openness to experience and anchor.

	Anchor					
	High			Low		
Openness	N	Mean	Std. error	N	Mean	Std. error
High	69	43.46	3.07	66	33.70	2.53
Low	31	25.29	3.50	34	37.27	4.49

the percentage of African nations in the UN as the dependent variable. These analyses revealed no significant interaction effects for any other Big-Five personality traits: extraversion ($F(1, 195) = .01$, $p > .9$), agreeableness ($F(1, 195) = .14$, $p > .7$), conscientiousness ($F(1, 195) = .34$, $p > .56$) and emotional stability ($F(1, 195) = .27$, $p < .11$).

4 Discussion

In this paper we set out to test whether the fifth factor of openness-to-experience, as depicted by McCrae & Costa (1997; 1999), may influence individual sensitivity to anchor cues and in turn, individual judgments. Across two separate tasks involving estimates about the length of the Mississippi river (Study 1) and membership of African nations in the UN (Study 2) we examined the hypothesis that individuals high in the personality trait of openness-to-experience would be more influenced by a previously presented anchor relative to individuals low in this trait. We found partial support for this hypothesis. Our findings demonstrated that high openness-to-experience participants were more influenced by high and low anchoring cues for the Mississippi river estimation task but only for high anchors in the African nations task.

Limitations. Several limitations are present within the current studies. First, the measure we selected to assess openness-to-experience was chosen because of its conciseness and brevity; however, its short length comes at the expense of reliability, a psychometric limitation that is indigenousness to all short instruments. Furthermore, the TIPI scale, again due to its length, is able to offer only a broad assessment of the Big-Five personality constructs. The Big-Five dimensions are principally broad constructs that can be broken down into several related but discrete components. For example, it has been argued that openness-to-experience consists of several narrower facet-level constructs, such as creativity and intelligence. As noted by its authors, the TIPI is unable to provide scores for these facet-level constructs, which are often better predictors of specific criteria (Gosling, Rentfrow, & Swann, 2003). Though the TIPI scale offered a sensible option for the present studies, future research investigating how personality traits mediate susceptibility to anchoring cues may benefit from investing in multi-item measures of the Big-Five to avoid these limitations.

Another potential problem surfaces around the fact that we found our strongest evidence within the high anchor condition. Because our findings were largely driven by the high anchoring condition in Study 2, it is possible that our results could be an artifact of high openness individuals making higher estimates in general. More specifically, it could be the case that high openness participants have a general tendency to estimate higher numbers relative to low openness individuals, especially in Study 2. In order to examine this possibility, we provided a separate set of participants with either the Mississippi length estimation task or the African nations task without the presence of an anchor. If it is the case that greater levels of openness lead to greater number estimations then we would expect correlations indicative of this relationship. Our results did not reveal a significant correlation between openness scores and participants' estimates for either the Mississippi river task ($r(33) = .2$ $p > .24$) or the African nations task ($r(33) = .02$ $p > .87$). Thus, these results provide evidence that our earlier findings were not just due to a relationship between openness and estimation tendency. Rather, the nonexistence of such a correlation supports our contention that higher levels of openness lead individuals to become relatively more influenced by anchoring cues.

Future research. The fact that we found differences for openness and low anchors in one study and not the other raises some interesting questions for future research. For example, It could be the case that we experienced a "floor effect"[3], in that, anchor-free estimates for the African nations study may be closer to low anchor estimates relative to the Mississippi river study. Although speculative, this could be why high openness participants did not appear to be as affected by the low anchor in the African nations study. In order to attempt to provide a post-hoc observation of this possibility, we collapsed across our openness variable and only observed mean estimates for the high

[3] Special thanks to the reviewers for pointing this out.

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and low anchor conditions for both our studies as well as our anchor-free study. Observation of this data across studies reveals that the anchor free estimates of the Mississippi river length (M = 4681.50) fell roughly between the average estimates in the high anchor (M = 8497.28) and low anchor (M = 904.66) conditions. The African nations anchor-free study yielded a mean (M = 35.15) that appears descriptively closer to the low anchor mean (M = 34.91) than the high anchor mean (M = 37.77). While this is only a post-hoc observation, it does provide an interesting possibility for future research.

These findings also pose interesting questions about how individual differences in openness-to-experience may influence judgments for other heuristics and biases as well. This should be especially true for decision tasks where reliance on external information is involved. One example of when external cues influence judgments is the framing effect (Kahneman & Tversky, 1979). Previous research has found a relationship between openness and risk preference, such that, high openness individuals demonstrated relatively more risk-seeking in their choices for typical framing tasks (Lauriola & Levin, 2001; Levin, Gaeth, Schneider, & Lauriola, 2002). Future research may want to explore whether this effect is due to reliance on external information (e.g., the frame) or whether it represents a general tendency among high openness individuals.

Another interesting question that emerges is whether individuals low in openness-to-experience may be influenced by other factors when making judgments. Specifically, just as high openness-to-experience individuals were more influenced by external anchoring cues, might it be the case that low openness individuals are more influenced by internally generated information? While we did not explore this question in our current set of studies it certainly raises questions for future research.

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