



# Harmony Between Humanity and Nature: Natural Vs. Synthetic Drug Preference in Chinese Atheists and Taoists

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## Abstract

A commonplace observation across many cultures is that humans show a strong preference for natural items on drug choice in the medical domain. Despite an emerging line of psychological research on individual differences in the naturalness-is-better bias, few studies have focused on the role of religious beliefs. According to the core idea of Taoism, people should free themselves from selfishness and desire and behave in concert with the alternating cycles of Nature. Based on the findings regarding the positive relationship between connectedness to nature and naturalness preference, we predict that Taoists, who emphasize harmony between humanity and nature, should show a stronger naturalness-is-better bias than atheists on drug choice due to their higher level of natural connectedness. The results showed that both Chinese atheists and Taoists selected a natural over synthetic drug even though the safety and efficacy of the medicines were described as identical. More importantly, the naturalness-is-better bias is more pronounced in Taoists than atheists. These data suggest that religious beliefs related to individuals' connectedness to nature may moderate the naturalness-is-better bias in health decisions.

**Keywords** Taoism · Heuristics and biases · Nature connectedness · Drug choices · Health decisions

## Introduction

In the past few decades, a substantial body of research in the psychological and medical literature has explored the complex relationship between religion and physical and mental health (Hart & Koenig, 2020; Koenig et al., 2012; Miller & Thoresen,

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2003; Seybold & Hill, 2001). The proliferation of scientific literature indicates that religion and spirituality have a predominantly positive influence on individuals' well-being and health (Fredrickson, 2002; Holt et al., 2014; Koenig, 2020), though others suggest a potential negative role (Hall et al., 2004). Setting aside many unexplored and disputed aspects of this relationship, in the present research we investigated the interconnections among religious beliefs, cognitive bias, and health decisions regarding natural vs. synthetic drug preference in Chinese atheists and Taoists.

The naturalness-is-better bias is one of the well-documented decision biases in the literature (Kellert & Wilson, 1995; Meier et al., 2019a, b; Migliore et al., 2018). The naturalness bias refers to the preference for natural items (e.g., foods and medicines) even when they exhibit the same or less efficacy and safety than artificial or synthetic alternatives (Shepard, 1993; Wilson, 1984). Evidence in favor of the naturalness-is-better bias has been reported for different populations and domains. For example, Rozin et al., (2012) conducted a cross-cultural research to examine how individuals from six cultures (France, Germany, Italy, Switzerland, the U.K., and the U.S.) linked valence to the term *natural*. They found that people were more prone to associating positive attributes (e.g., health and goodness) with *natural*, especially when they lacked sufficient knowledge or information for the judgment.

Despite the ubiquity of the naturalness-is-better bias in diverse areas such as food (Li & Chapman, 2012), job recruitment (Tsay & Banaji, 2011), lighting (Haans, 2014), health and beauty products (Apaolaza et al., 2014), and cigarettes (Baig et al., 2019), much of the research investigated the naturalness preference in the medicine domain, which is highly relevant to the field of health and healing. For example, Meier and Lappas (2016) presented participants with a hypothetical scenario and asked them to choose between a natural, plant-derived, or a synthetic, laboratory-made drug with the same safety and efficacy. The results showed that a majority of participants selected the natural vs. synthetic drug and rated the former as safer than the latter. This pattern of results suggests that the label natural can bias individuals' preferences and perceptions of medicines.

Recent evidence suggests that individual differences may moderate the naturalness-is-better bias. Reasoning that the default naturalness-is-better belief is contingent on the evolutionary processes of the human species, such as ancestor of humans completely depending on the natural environment to survive, Li and Cao (2020) predicted that natural connectedness, one's deep relationship with all living beings on Earth, would be positively associated with the naturalness-is-better bias. In line with the predictions, they found that participants, - who selected the natural drug, - displayed a higher level of natural connectedness than participants selecting the synthetic drug. Additionally, the positive relationship between natural connectedness and naturalness preference is robust in both Chinese student and non-student populations. These findings suggest that individual characteristics, such as connectedness to nature, may play a vital role in the naturalness-is-better bias.

Indeed, different groups may feel close to and are identified with nature to varying degrees. Some research suggests that religious beliefs may affect people's connectedness to nature (Conroy, 2007; Tucker, 1993). For instance, an essential idea for Taoism, an ancient and indigenous religion in China, is being in harmony with the external natural world. Within Taoism, human life is only a tiny fraction of the

universe and a small piece of a larger process of nature (Karcher, 1999; Oldstone-Moore, 2003). This naturalness preference is also reflected in Taoists' eating habits and diet in which alcohol, sugar, processed food, and animal products are forbidden. In addition, as a microscopic blip in the cosmos, humans should free themselves from selfishness and desire and behave in concert with the alternating cycles of Nature (Ames, 1986). Thus, from the point of view of Taoism, unnatural assertiveness and obsession with worldly goals are the underlying causes of unhappiness and violent conflicts (Parkes, 1989). If Taoism encourages its believers to take their natural course (keeping with the Tao) rather than doing something unnatural, we would expect that compared to atheists, Taoists will manifest natural connectedness to a greater degree, thus promoting their preference for natural substances.

In the current inquiry, we examined the interconnections among religious beliefs, nature connectedness, and drug choice, predicting that: (1) Chinese Taoists should display a markedly higher level of nature connectedness than Chinese atheists due to the former's strong faith in enhancing harmony with nature; (2) Chinese Taoists should display a more prominent naturalness-is-better bias than atheists. Finally, numerous studies have suggested that perceptions of safety can at least partly account for people's preference for natural items. For example, Baig et al. (2019) investigated the impact of natural cigarette advertising on people's perceived risk of smoking. They found that the marketed "natural" composition significantly boosted daily smokers' interest in products with this misleading terminology. Based on these findings, we predicted that the safety ratings of the natural vs. synthetic drug would be a significant predictor of people's drug preference.

## Methods

### Participants

Sample sizes varied according to the availability of participants. To control for the opportunistic use of Research Degrees of Freedom which may tweak the data and increase the false positive rate in experiments (Charles et al., 2019), we did not perform any statistical analysis of the results until all data collection was completed, and no additional data were added after the initial analyses.

We took a "just minimal difference" approach for the participant selection (Li & Cao, 2019; Uskul et al., 2008), which can actively control as many confounding variables potentially associated with the naturalness-is-better bias as possible while focusing on the key factor of Taoism. Specifically, the two groups of participants had spent most of their lifetime in the same city and shared many main sociodemographic characteristics such as age, sex, ethnicity, educational attainment, and marital status (Table 1). The only variable that differed between the two groups was monthly income since Taoist monks only received a small payment for undertaking religious activities.

A total of one hundred and forty-four Taoist monks from six different Taoist temples in the Sichuan province were invited to take part in the study. They have converted to Taoism and chose to practice Taoist principles as a way of life for at least

**Table 1** Participant demographic characteristics

Group	Age	Gender (M)	Education	Marital status	Income	ethnicity
Taoists ( <i>N</i> = 144)	35.6(4.5)	144	Primary school: 62 High school: 75 Bachelor: 7	Single	≤800 RMB: 113 801–1000 RMB: 31	Han: 144
Atheists ( <i>N</i> = 152)	34.2(3.9)	152	Primary school: 66 High school: 78 Bachelor: 8	Single	2500–4000 RMB: 127 4000–5000 RMB: 25	Han: 152

5 years (average conversion = 71 years). They regularly performed Taoist rituals including practicing meditation and martial arts (Tai Chi), reading Taoist scriptural texts, and giving offering to deities.

One hundred and fifty-two male adult atheists from the same cities were invited to take part in the study. They were matched to the Taoist monks on age, sex, racial background, marital status, and highest academic award. Participants were classified as atheists according to their self-rating on a single question: “I would describe myself as\_\_” (“atheistic”, “agnostic”, or “religious”). In addition to their self-classification, religiously unaffiliated participants were further asked to report whether they had any contact with religious teachings or whether they had any specific religious experience. Only those that said “not at all” consisted of our atheistic condition. Each atheist participant was reimbursed 10 yuan for study-related expenses. Since Taoist participants cannot accept monetary reward due to religious reasons, we donated the same amount of money for each Taoist participant to the temples which they were affiliated with.

## Materials and Methods

After providing informed consent, respondents were asked to complete a paper-and-pencil questionnaire. In the first part of the questionnaire, they responded to several questions requesting their demographic information such as age, sex, and ethnicity. Following the demographic questions, we employed the same experimental question that was used in Meier and Lappas (2016), Meier et al., (2019a, b), and Li and Cao (2020) to explore participants’ drug choice. However, researcher may cast doubt on the predictive validity of single-item measures (Bergkvist & Rossiter, 2007). Recent studies examining the naturalness bias with actual behavior showed that people tend to demonstrate the similar naturalness bias found in self-reports. These findings indicate that response to one single choice question under a hypothetical situation can closely mirror real-life decision-making, which suggests that the single choice

question is a reliable and valid paradigm to investigate the naturalness bias at least in the medical domain. Participants were presented with a hypothetical scenario as follows:

Imagine that your doctor imparts you some news that you face a medical condition and need to use medicines to cure the disease. Now, you have a set of alternatives for consideration:

Option 1 is a synthetic drug which is chemically created in a laboratory by scientists. A decades' research has demonstrated the effectiveness of the drug in treating disease in 85% of users. On rare occasions, patients may experience some mild unpleasant effects. A serious allergic reaction to the medicine may occur in 0.5% of users.

Option 2 is a natural drug which is obtained from a commonly observed plant. A decades' research has demonstrated the effectiveness of the drug in treating disease in 85% of users. On rare occasions, patients may experience some mild unpleasant effects. A serious allergic reaction to the medicine may occur in 0.5% of users.

According to the instructions, the efficacy of and the safety of the plant-derived and the synthetic drugs are the same. After providing their responses to the choice question, participants were asked to rate the safety of each drug on a 9-point Likert-type scale, where 1 = *not at all safe*, 5 = *moderately safe*, and 9 = *very safe*. Then, participants completed two seemingly unrelated tasks involving a general knowledge quiz and a personality test. Following these tasks, a Chinese version of Connectedness to Nature Scale (CNS) was used to assess the extent to which individuals include nature as part of their identity (Li & Cao, 2020; Mayer & Frantz, 2004). The CNS contains 14 items which were measured on a 5-point Likert scale (Cronbach's alpha was 0.89 for Taoists and 0.93 for atheists). The sample items include "*I often feel part of the web of life*" and "*When I think of my life, I imagine myself to be part of a larger cyclical process of living*". On the final stage of the survey, participants were probed for suspicion by debriefing about the true purpose of the study and were thanked for their time and cooperation in the study.

## Results and Discussion

Debriefing responses indicated that no respondents issued any suspicion about the relationship between religiosity and the drug preference. Since the plant-based and the synthetic drugs are identical in terms of safety and efficacy, participants should go for a 50–50 approach and thus show no particular preference for these two drugs. Contrary to this prediction, we found that a majority of atheists (69.1%) chose the natural drug with respect to the synthetic drug, at a rate that differed higher than 50% representing the chance level,  $\chi^2(1, N=152)=22.13, p<0.001$ , Cramer's Phi=0.38, 95%CI=[0.2302, 0.5149]. In a similar vein, a vast majority of Chinese Taoists (84.1%) also demonstrated a strong preference for the natural drug versus synthetic drug, at a rate that differed higher than the chance level,  $\chi^2(1, N=144)=72.25, p<0.001$ , Cramer's Phi=0.71, 95%CI=[0.5915, 0.7960]. In order to verify whether the strength of naturalness-is-better bias differed significantly between Chinese atheists and Taoists, we performed a  $2 \times 2$  Chi-Square test

for independence to examine the results. The test revealed a statistically significant effect,  $\chi^2(1, N=296)=11.15, p=0.001$ , Cramer's  $\phi=0.19$ . Indeed, Chinese Taoists showed a greater tendency to believe that drugs with a natural label are better than did atheists did. This pattern of results suggests that the naturalness-is - better bias is more pronounced in Chinese Taoists, which is consistent with our prediction. In addition, Chinese Taoists ( $M=3.60, SD=0.55$ ) displayed a significantly higher level of nature connectedness than their atheist counterparts ( $M=3.05, SD=0.87$ ),  $t(294)=6.50, p<0.001, d=0.76, 95\%CI=[0.3839, 0.7176]$ , which is in line with Taoist philosophy highlighting the value of living in harmony with nature.

We used nature connectedness to predict drug choice (natural = 1; synthetic = 2) in a logistics regression analysis for Taoists and Atheists, respectively. As expected, we found that nature connectedness was a positive and significant predictor of drug choices for both groups: Taoists: Wald  $\chi^2(1, N=144)=10.31, p=0.001$ , odds ratio = 0.22, 95% CI = [0.084, 0.549]; Atheists: Wald  $\chi^2(1, N=152)=6.22, p=0.013$ , odds ratio = 0.60, 95% CI = [0.400, 0.896]. In addition, a bootstrapping analysis with 5,000 iterations offered supporting evidence for the mediating role of nature connectedness in the relationship between sample type and drug choice, as the 95% bias-corrected confidence interval for the indirect effect did not include zero [-0.6477, -0.1794] (Preacher & Hayes, 2008).

Finally, we tested a relationship between individuals' safety ratings and their drug choices. Chinese atheists rated the plant-derived drug as being much safer ( $M=7.00, SD=1.04$ ) than the chemically-created drug ( $M=6.34, SD=1.41$ ),  $t(151)=5.37, p<0.001, d=0.87, 95\%CI=[0.42, 0.90]$ . Chinese Taoists showed a similar choice pattern and perceived the natural drug ( $M=7.65, SD=1.01$ ) to be safer in comparison to the synthetic drug ( $M=6.74, SD=1.53$ ),  $t(143)=6.17, p<0.001, d=1.03, 95\%CI=[0.62, 1.21]$ . However, the two groups did not show significant differences in the safety rating differences,  $t(294)=1.35, p=0.18$ . To determine whether the difference related to safety ratings is a positive predictor of each participant's drug choice, a perceived-safety index (PSI) was created using their safety ratings of these two drugs:  $PSI = \text{the natural drug rating} - \text{the synthetic drug rating}$ , as did in Meier and Lappas (2016: Study 1). A positive score should denote that the safety rating of the plant-derived drug is higher than the chemically-created drug, while a negative score suggests an opposite pattern. We built a logistics regression model by using the overall safety ratings of these two drugs and drug choices (natural = 1; synthetic = 2). Participants' PSIs were a highly significant predictor of their responses on the drug choice, Wald  $\chi^2(1, N=296)=14.65, p<0.001$ , odds ratio = 0.699, 95% CI = [0.584, 0.840]. Lower PSIs were linked to a greater likelihood of selecting a synthetic drug, and higher PSIs were linked to a greater likelihood of selecting a natural drug.

## General discussion

Extensive research on cognitive biases has consistently shown that people tend to rate a rich variety of natural items as being better, safer, and healthier than non-natural items in their judgment and decision-making (Koval & Rosette, 2020; Meier

et al., 2019a; Rozin et al., 2004). Extending beyond these findings, the current research compared natural preferences on drug choice from two groups of participants with different degrees of nature connectedness: Chinese Taoists and atheists. We found support for our three main predictions: (1) Chinese Taoists exhibited a higher level of nature connectedness than did Chinese atheists did, (2) the naturalness-is-better bias is more apparent in Chinese Taoists than atheists, and (3) differences related to safety ratings are a positive predictor of drug preference.

The present study makes several notable contributions that advance theory and inform research regarding the relationship between religion and health. First, we contribute to the existing research on cognitive bias, this time within the religious context. It is well-recognized that when investigating human psychology and behavior such as cognitive bias and decision-making process, researchers should take the role of culture into account (Modell et al., 2014; Röcklinsberg, 2009; Tam & Milfont, 2020). However, the psychological literature has a strong WEIRD (Western, Educated, Industrialized, Rich, and Democratic) and an Abrahamic basis (Henrich et al., 2010). Though a small number of studies in recent years have begun to focus on populations outside of a Western-developed culture (*e.g.*, China), no research to date, to the best of our knowledge, has paid sufficient attention to the role of religious beliefs in the naturalness-is-better bias related to health decisions.

To address this issue, the present study broadens the scope of culture and focuses on a non-Abrahamic and on an understudied religion, namely, Taoism. Sampling this population who have particular beliefs about achieving the integration between humanity and nature allows us to explore the scalability of the naturalness-is-better bias in the medical domain, which has hardly been touched upon in the literature. Thus, our findings provided the first empirical evidence that the strength of naturalness-is-better bias was different between Chinese Taoists and atheists when they were asked to make health decisions (*e.g.*, selecting a natural vs synthetic drug). Some research has demonstrated that religion may produce a pro-environmental stewardship of God's creation effect (Woodrum & Wolkomir, 1997). However, other research has yielded evidence in for the opposite opposition. For instance, Hand and Van Liere (1984) found that conservative Christians tended to be less environmentally concerned than the general public. Thus, it would be valuable to investigate whether the strong naturalness bias can also be found in other religious populations (*e.g.*, Christianity and Hinduism) in future studies.

Second, the “just minimal difference” approach adopted in this study enables us to draw relatively strong causal inference. Our results suggest that a higher sense of connectedness to the natural world associated with Taoist thought may contribute to people's increased preference for a natural drug. These findings are in line with the results of prior work. For instance, Wang and Stringer (2000) found that both philosophical and religious Taoism exerts an important influence on Chinese people's practice of leisure, such as encouraging more close connections to the natural world. Yet, some critics may argue that Taoism is more attractive for individuals with a greater preference for a natural drug. To exclude this potential theoretical explanation, we compared two groups of participants who shared many demographic variables including age, sex, race, diplomas of highest education and yet differed in religious beliefs. This design feature of research

helps us control for theoretically salient explanatory variables and focus on the role of Taoism in the naturalness-is-better bias. Despite this, note that the nature of our data is still correlational. Future research using religious priming can provide more confirming evidence for the causal effect of religion on naturalness preference.

Finally, our findings have some important implications for health policy and practice. Medicines with natural labels have a high emotional appeal for individuals, especially for religious believers as shown in the current research. However, the natural label can also be misleading and misguided. For instance, the aristolochic acid in Birthwort plants, which was used for treating a variety of diseases such as arthritis in Chinese traditional herbal medicines, has been reported as a human cancer hazard (DeBelle et al., 2008). Since Taoists manifest a more salient naturalness-is-better bias, it means that they may have stronger objections to non-natural medications such as vaccinations against the COVID-19. In a very recent study, Meier et al., (2021) found that there is an inverse relationship between naturalness bias and the intention to receive a COVID-19 vaccine. Thus, the strong belief about natural is better in Taoists may make them become vulnerable populations during the pandemic response (Clarke et al., 2017). Meier et al., (2019b) found that the rational appeal (*e.g.*, natural drugs can be poisonous) can significantly reduce the natural drug bias. Based on these findings, a stronger rational appeal may be needed to reduce the naturalness-is-better bias in drug choices among Taoists.

## Study Limitations

While the present study provides significant theoretical contributions and practical implications, it has some limitations. First, only male participants were included into our research due to religious reasons. Second, data collection tools primarily based on self-report and hypothetical scenarios were employed. Third, the item surveyed in the current study limited to the domain of medicine is by no means complete. Future research could determine whether Taoists exhibit a stronger natural-is-better bias in other domains such as food.

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### Declaration

**Conflict of interest** The authors declare that they have no conflicts of interest.

**Ethical Approval** This article does not contain any studies with animals performed by any of the authors. All procedures performed in studies involving human participants were in accordance with the ethical standards of Zhongnan University of Economics and Law research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.



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