RESEARCH ARTICLE

Cognitive entailments among "the true, the good, the beautiful": a mainland Chinese sample

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Abstract

Philosophers and cognitive scientists have long debated about the entailments among "the true, the good, the beautiful" (TGB hereafter). In the current article, we directly probed mainland Chinese subjects' cognitive entailment among TGB. Using 1–7 (Experiment 1) and 1–6 (Experiment 2) Likert scales, we convergently observed that mainland Chinese subjects tend to think that the beautiful is not the true, and that the good is the beautiful. Additionally, Experiment 1 also revealed that mainland Chinese subjects tend to think that the true is not the beautiful. Some of these results may reflect anthropological universals, and some others may reflect cultural specifics. Experiment 3 revealed that the most popular translation of TGB in Chinese into English is rather "the true, the kind, the beautiful", suggesting that the three concepts mapped to TGB in Chinese is not one-to-one mapped to the three concepts mapped to TGB in English. Therefore, caution should be exercised when making cross-linguistic or cross-cultural comparisons about TGB in the future.

Keywords The true, the good, the beautiful · Moral · Beauty · Entailment · Inference

Introduction

"The good, the true, and the beautiful" (TGB hereafter) is a common triad in the public discourse of many cultures (Changeux 2012; Bargheer and Wilson 2018; Hockx 2022); for example, it is called "Das Schöne, Wahre und

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Gute" in Germany in German, and it is called "真善美" (zhēnshànměi) in mainland China in Chinese. Although often attributed to the ancient Greek philosophers, according to Martin (2017), this triad actually first appeared (in the West) in Johann Ulrich König's work in 1727, and was later made popular in many Western cultures especially by Claude Yvon's book *Lectures on the True, the Good, and the Beautiful* in 1853. As of now, this triad is also an established expression in some East Asian cultures, including in mainland China (Gu 2002; Xu 2018; Hockx 2022; Yin et al. 2022), although the exact history of its acceptance remains to be deciphered.

Philosophers have long debated about the entailment relationships among TGB at the metaphysical level; while some argued that some of them entail others, others argued that they are orthogonal to each other (for a review see Martin 2017). How we *cognitively* reason based on these three concepts is still largely unknown; this triad is of special importance to cognitive scientists because it cuts across the fields of empirical aesthetics and social psychology. Notably, a considerable amount of research has focused on "good" and "beautiful". It has been demonstrated in several cultures that one tend to think that beautiful people are good and vice versa (the "beautiful is good" and "good is beautiful" stereotype; Gross and Crofton 1977; Owens and Ford 1978;

Eagly et al. 1991; Wheeler and Kim 1997; Little et al. 2006; Han et al. 2018; He et al. 2022).[1] "Beautiful" and "good" have also received considerable attention in neuroimaging studies: brain regions responsive to aesthetic judgements and moral judgements are shared (Zeki 2014, 2019), with moral judgement regions including aesthetic judgement regions (Tsukiura and Cabeza 2011; Avram et al. 2013; Wang et al. 2015, 2021). On the one hand, these results suggested that aesthetic judgement may be an evolutionary and cognitive prerequisite for moral judgement (Sütterlin and Yu 2021; Wang et al. 2021). On the other hand, and to our current interest, these results also left open the possibility that "a thing is good" entails that "it is beautiful" (i.e., GOOD(x)—> BEAUTIFUL(x)) in cognitive reasoning. However, it is unclear whether these entailments are available to conscious reasoning, if there are such entailments (but not simply associations). Meanwhile, "true" has received much less attention in the literature compared to "good" and "beautiful".

In our current study, we directly asked mainland Chinese subjects to rate statements like "the beautiful is definitely the good" on a Likert scale (Exp. 1: 1–7 Likert scale; Exp. 2: 1–6 Likert scale), in order to directly probe their cognitive entailments among TGB. This is, to our knowledge, the first study where subjects were *explicitly* probed about their cognitive entailments among TGB.

Experiments

Experiment 1: 1–7 Likert scale

Materials

This survey composed of 6 pairs of propositions, and subjects responded on a 1–7 Likert scale. 1 stood for that the proposition to the left was completely correct, and 7 stood for that the proposition to the right was completely correct. The 6 pairs of propositions (S1-S6 hereafter) were: (S1) the beautiful is definitely not the good—the beautiful is definitely the good (美的一定不是善的-美的一定是善的);

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[1] Note that Glennon and Zeki (2022) argued that "good" and "beautiful" are fundamentally different from each other, in that facial beauty relies more on inherited biological priors while goodness (i.e., moral beauty) relies more on acquired "artificial" priors. However, this is not exactly the same question as the one about entailment here: two concepts can be completely different yet they still *entail* (cf. Quine 1951) each other, just as BEING_A_TABLE(x) entails CONSISTING_OF_ATOMS(x) (i.e., that something is a table entails that it consists of atoms), yet these two concepts can be completely different in representation (i.e., the representation of the BEING_A_TABLE concept can be completely different from the representation of the CONSISTING_OF_ATOMS concept).

(S2) the beautiful is definitely not the true—the beautiful is definitely the true (美的一定不是真的-美的一定是真的); (S3) the true is definitely not the beautiful—the true is definitely the beautiful (真的一定不是美的-真的一定是美的); (S4) the true is definitely not the good—the true is definitely the good (真的一定不是善的-真的一定是善的); (S5) the good is definitely not the true—the good is definitely the true (善的一定不是真的-善的一定是真的); (S6) the good is definitely not the beautiful—the good is definitely the beautiful (善的一定不是美的-善的一定是美的). The 6 propositional pairs were presented at a random order for each subject. We distributed both simplified Chinese and traditional Chinese versions of this survey. The survey was hosted on Qualtrics (https://www.qualtrics.com/) and was conducted and returned in March, 2020.

Subjects

130 subjects participated in this survey. Since the majority of the participants were young people with a nationality of mainland China (based on self-report), only participants with the age of 18–28 and a nationality of mainland China (all based on self-report) entered our data analysis. This resulted in 95 participants (age $M \pm SD = 22.1 \pm 2.6$; 37 male, 57 female, 1 other; all undergraduate students or above in education; all having Chinese as their mother tongue). This sample sizes in our current study were not planned and were subjective to time and resource constraints. The experiments were approved by the ethical committee of the School of Psychological and Cognitive Sciences at Peking University and were in accordance with the Declaration of Helsinki.

Analysis

The 95% confidence interval (CI) for the mean of each proposition pair's rating was calculated through basic bootstrap (iteration = 10,000), using the "boot" package (Canty and Ripley 2022) in R 3.6.0.

Results

The 95% CI for S1 was (3.79, 4.25); the 95% CI for S2 was (3.47, 3.95); the 95% CI for S3 was (3.50, 3.98); the 95% CI for S4 was (3.55, 4.05); the 95% CI for S5 was (3.86, 4.36); the 95% CI for S6 was (4.46, 5.07). Therefore, the 95% CIs for S2 and S3 were below the mid-point (i.e., 4); the 95% CI for S6 was above the mid-point (Fig. 1).

In other words, mainland Chinese subjects tended to think that the beautiful is not the true, that the true is not the beautiful, and that the good is the beautiful. In order to see how well this result replicates, and to introduce a force-choice task against the cultural-specific preference for the
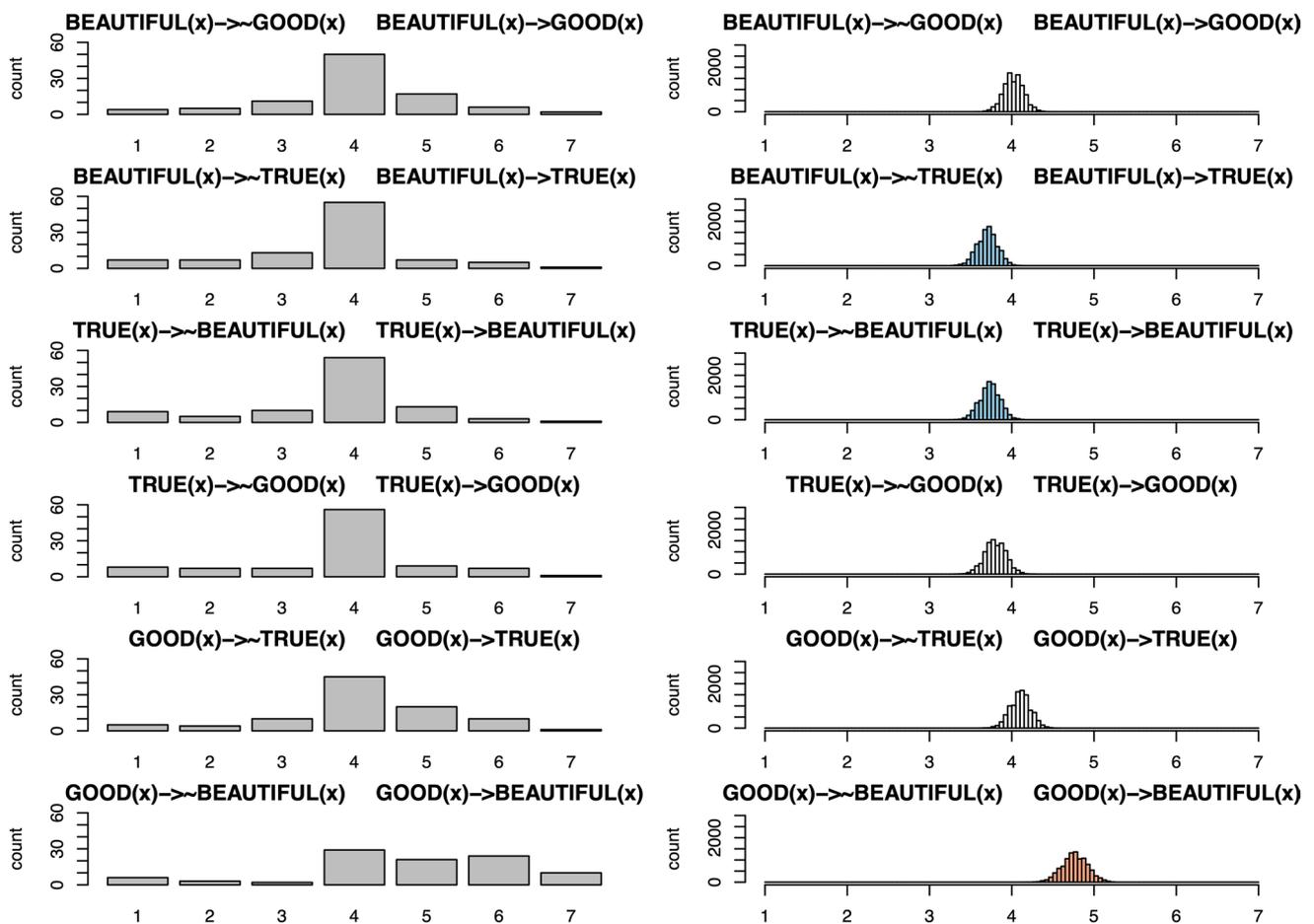
Fig. 1 Results of Experiment 1. The left column is the distribution of ratings for each proposition pair. The right column is the bootstrapped distribution of the mean of these ratings (bin width = 0.1). Blue distribution represents that the 95% confidence interval is below the midpoint of the Likert scale (i.e., 4); orange distribution represents that the 95% confidence interval is above the mid-point of the Likert scale

mid-point in Likert scales in many East Asian cultures (Lee et al. 2002), we ran Experiment 2 with the same proposition pairs but with a 1–6 Likert scale, whose mid-point was 3.5.

The raw data for all experiments in this paper are openly available on OSF (https://osf.io/w76dk/).

Experiment 2: 1–6 Likert scale

Materials

Same as Experiment 1, except that we employed a 1–6 Likert scale. We distributed only the simplified Chinese version of this survey. The survey was hosted on Qualtrics (https://www.qualtrics.com/) and was conducted and returned in April, 2020.

Subjects

54 subjects who self-reported not having participated in Experiment 1 participated in this survey. Following Experiment 1, only participants with the age of 18–28 and a nationality of mainland China (all based on self-report) entered our data analysis. This resulted in 45 participants (age $M \pm SD = 19.9 \pm 2.0$; 23 male, 22 female; all undergraduate students or above in education; all having Chinese as their mother tongue).

Analysis

Same as Experiment 1.

Results

The 95% CI for S1 was (3.00, 3.69); the 95% CI for S2 was (2.76, 3.29); the 95% CI for S3 was (3.07, 3.73); the 95% CI for S4 was (3.00, 3.58); the 95% CI for S5 was (3.16, 3.84); the 95% CI for S6 was (3.78, 4.49). Therefore, the 95% CI for S2 was below the mid-point (i.e., 4); the 95% CI for S6 was above the mid-point (Fig. 2).
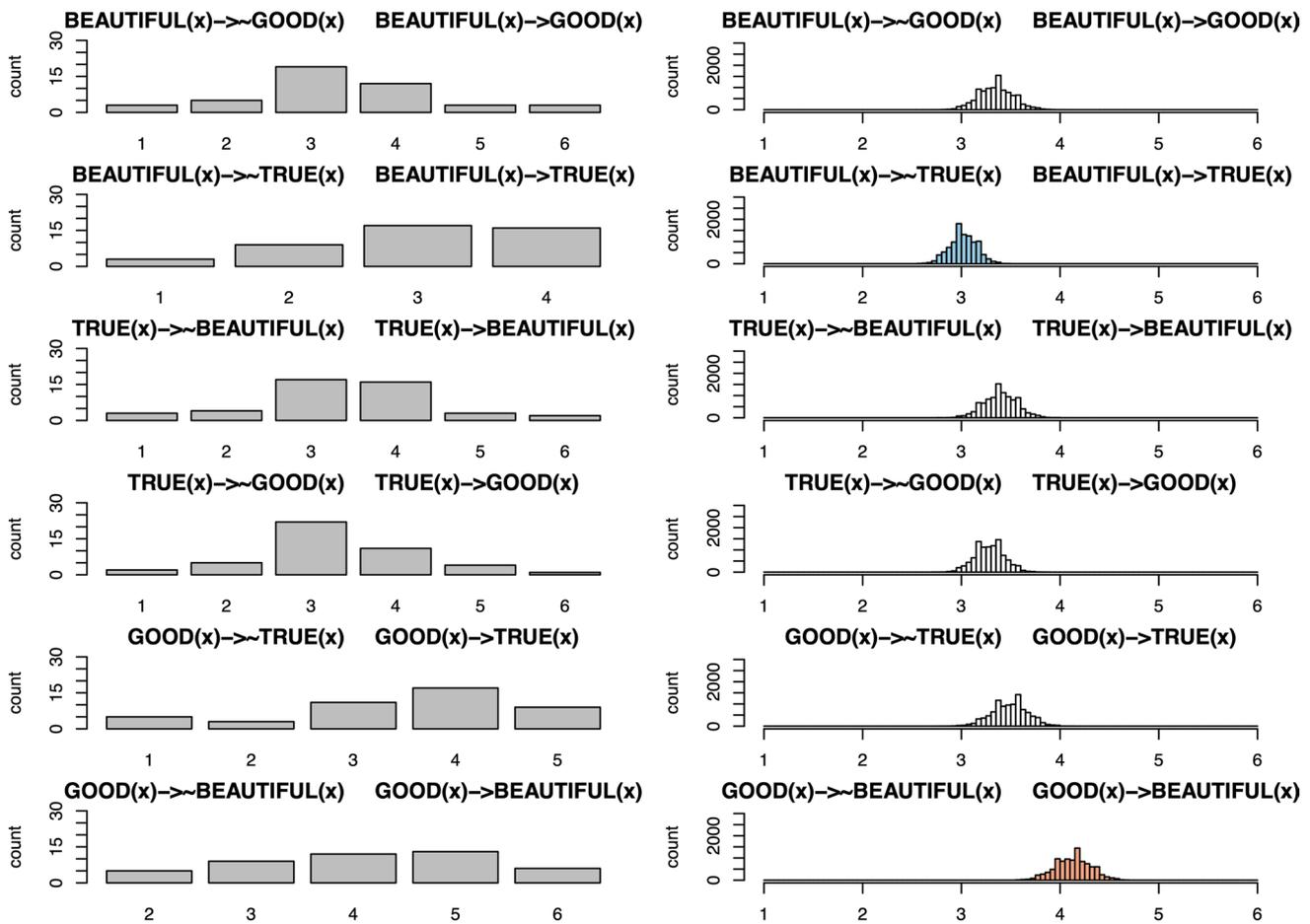
Fig. 2 Results of Experiment 2. The left column is the distribution of ratings for each proposition pair. The right column is the bootstrapped distribution of the mean of these ratings (bin width = 0.1). Blue distri-

bution represents that the 95% confidence interval is below the mid-point of the Likert scale (i.e., 3.5); orange distribution represents that the 95% confidence interval is above the mid-point of the Likert scale

The results of Experiment 2 replicated Experiment 1 in that the 95% CI for S2 was below the mid-point and the 95% CI was above the mid-point, except for the result that the 95% CI for S3 was below the mid-point (which was only present in Experiment 1). Taken together, Experiment 1 and Experiment 2 offered converging evidence that mainland Chinese subjects tend to think that the beautiful is not the true, and that the good is the beautiful, and suggested that they may also think that the true is not the beautiful (Fig. 3).

In Experiment 3, we explored the feasibility of conducting a cross-linguistic comparative study about TGB in the future. Although TGB is an established triad in many cultures, this does not guarantee that the linguistic forms are mapped to the concepts in the mind in the same way across languages and cultures. Therefore, in Experiment 3, we asked English-proficient mainland Chinese subjects to translate TGB in Chinese ("真善美") into English.

Experiment 3: translating TGB in Chinese into English

Materials

We asked the subjects how they would translated TGB in Chinese ("真善美") into English, as well as whether they

Fig. 3 A schematic illustration of our observations in Experiment 1 and 2. Orange arrows stand for entailment (the orange arrow from GOOD(x) to BEAUTIFUL(x) illustrates that GOOD(x)—> BEAUTIFUL(x)); blue arrows stand for the entailment of the inverse of the consequent (e.g., the blue arrow from BEAUTIFUL(x) to TRUE(x) illustrates that BEAUTIFUL(x)—> ~TRUE(x))
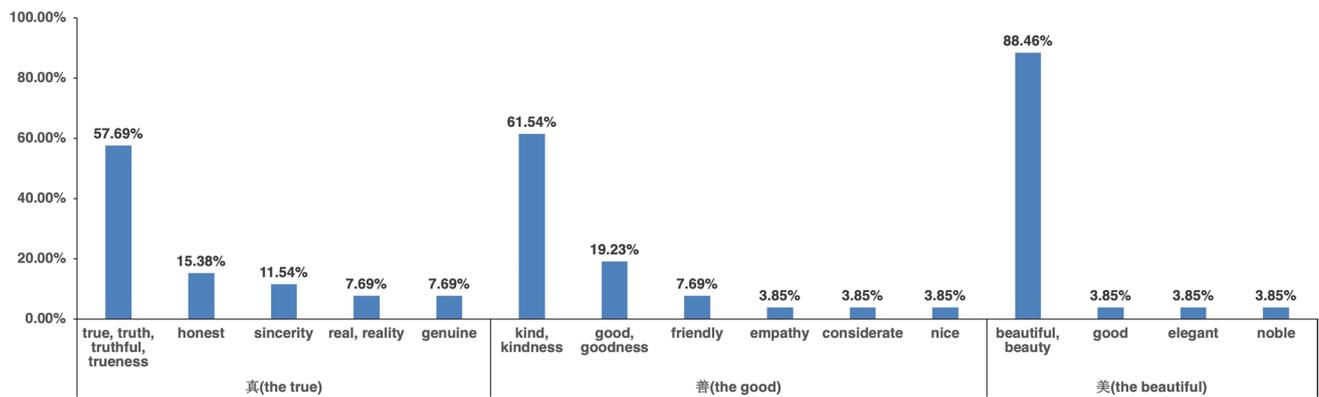
Fig. 4 Proportions for different translations of TGB in Chinese into English

knew the standard translation of TGB in English. The survey was hosted on WJX (https://www.wjx.cn/) and was conducted and returned in April, 2020.

Subjects

31 subjects participated in this survey. Only participants with a nationality of mainland China and not knowing the standard translation of TGB in English (all based on self-report) entered our data analysis. Additionally, 2 subjects were excluded because they responded with one single word. This resulted in 26 participants (age 18–34, $M \pm SD = 22.0 \pm 4.0$; all undergraduate students or above in education; all with Chinese as their mother tongue). They all passed some type of English qualification exam (CET4 or CET6 or with a TOEFL score ≥ 102 or with an IELTS score ≥ 7.5).

Analysis

We calculated the occurrence for each word root (i.e., collapsing cases like true, truth, truthful, etc.).

Results

For results see Fig. 4. The subjects were relatively diverged in their translation for "the true" and "the good". Notably, most subjects' translation of 善 (which is supposed to be "the good") is "the kind".

Taken together, our results suggested that the concepts mapped to the linguistic form of TGB in Chinese were not one-to-one mapped to the concepts for TGB in English. Therefore, caution should be exercised when making cross-cultural comparisons about TGB in the future.

Conclusions

Using 1–7 (Experiment 1) and 1–6 (Experiment 2) Likert scales, we convergently observed that mainland Chinese subjects tend to think that the beautiful is not the true, and that the good is the beautiful. Additionally, Experiment 1 also revealed that mainland Chinese subjects tend to think that the true is not beautiful. Experiment 3 revealed that the most popular translation of TGB in Chinese into English is rather "the true, the kind, the beautiful", suggesting that the three concepts mapped to the linguistic form of TGB in Chinese were not one-to-one mapped to the three concepts for TGB in English. Therefore, caution should be exercised when making cross-cultural or cross-linguistic comparisons about TGB in the future.

Discussion

Anthropological universals or cultural specifics?

Are these effects we observed with mainland Chinese subjects reflecting anthropological universals or cultural specifics (cf. Bao and Pöppel 2012; Blasi et al. 2022)? The entailment from good to beautiful may reflect the established "good is beautiful" stereotype that has been observed in many cultures, including in mainland Chinese subjects (Han et al. 2018). Notably, the presence of only the "good is beautiful" stereotype but not the "beautiful is good" stereotype in our current study is in line with Zhao et al. (2020). Zhao et al. (2020), complementing previous studies which mainly studied morality by subjects' judgements of moral traits, tested subjects' judgement of the actions carried out by more vs. less attractive subjects. They only found an effect from good to beautiful, but not from beautiful to good, resonating our current observation.

On the other hand, the mutual entailments between the beautiful and the true are likely culture specifics, as there is a widely known quote from *Tao Te Ching* (4 BC) in China, that "reliable words are not beautiful; beautiful words are not reliable" (信言不美,美言不信). Future research should test whether this is indeed a culture-specific phenomenon. We should also note that there is no reason to assume that our current convenient sample reflects *all* mainland Chinese people, since we only looked at younger subjects with Chinese as their mother tongue. "Mainland Chinese" consists of many cultural and linguistic groups; previous studies have demonstrated that meaningful social/psychological differences could be obtained when comparing across provinces within mainland China (Chua et al. 2019; Talhelm and English 2020; Zhang et al. 2021).

"The language trap" in cross-linguistic comparisons

Our Experiment 3 rang a bell towards future cross-linguistic/cultural investigations on TGB. That is, the conceptual representations for TGB in one culture/language may not be mapped to the conceptual representations for TGB in another culture/language in a one-to-one manner; the actual situation may be complicated. However, this "language trap" (cf. Pöppel 2018) is often overlooked; for example, studies in empirical aesthetics often implicitly assume that the word for "beauty" maps onto the same BEAUTY concept across different languages and cultures (this is what makes beauty judgement questions across languages and cultures comparable, as in Bao et al. 2016; Zhao et al. 2018; Yang et al. 2019; Hitsuwari and Nomura 2022; Ho, Szubielska and Kopiś-Posiej, 2022), which may not be the case (Bao et al. 2017; Thompson, Roberts and Lupyan, 2020; Brielmann et al. 2021; Lomas 2022). The "same" word (i.e., linguistic form) may also point to more than one concepts. For example, in Mandarin Chinese, the word that is closest to English "good" (善) can only refer to moral beauty (e.g., 善行, "good deed") but not physical beauty. This is different from English, where the word "good" cannot only denote moral beauty (e.g., "she is a good person"), but also physical beauty (e.g., "this person looks good"). Therefore, when observing any differences across languages or cultures, one will need to distinguish whether these differences are about the concepts themselves, or the mapping from linguistic forms to those concepts. For example, even within artistic beauty, German has at least two words "Stimmigkeit" and "Schönheit"; does this mean that German speakers have two different concepts BEAUTY1 and BEAUTY2 or that they only have one BEAUTY concept, and the two linguistic forms map onto e.g., BEAUTY&COHERENCE and BEAUTY&PLEASURE respectively? Furthermore, TGB is not an established expression in the public discourse of all cultures; this also poses a challenge to future studies of TGB.

Explicit questions versus indirect measurements

Most of previous studies on the relationship between good and beautiful mainly used indirect measurements (e.g., neural measurements or behavioral tasks where the research question was not obvious) instead of asking explicitly about their entailments as we did here; this is possibly based on an implicit assumption that it is not possible to obtain meaningful results from explicit questions. Therefore, the fact that we were able to obtain meaningful results from Experiments 1 and 2 was somewhat surprising. Further research is needed to examine how well-aligned the results are from explicit questions against those from indirect measurements, given that they may not align well for e.g., socially-sensitive aspects of cognition such as in-group bias (Xu et al. 2009; Sheng and Han 2012). Our current study offers complementary evidence to previous studies with indirect measurements, confirming that the "beautiful is good" stereotype is truly a cognitive *entailment* but not simply association.

One reviewer raised an intriguing question, that since in the current study we asked the subjects to rate on a Likert scale, we may still be probing probabilistic associations despite the fact that the questions were about entailment in nature, since a statement of e.g., "the good is beautiful" can only be either True or False. We still consider our results as reflecting cognitive entailments based on the following reasons. Firstly, associations, by definition, are mutual. In other words, if we observe a different-from-chance tendency on the question of "the good is beautiful", we should be able to observe the same tendency for "the beautiful is good", if what we are probing is the association between good and beautiful. In both Experiments 1 and 2, we only observed a tendency for "the good is beautiful" but not "the beautiful is good", suggesting that this effect was unlikely driven by associations between beautiful and good. However, following this logic, we should note that we cannot rule out the possibility that the observations for beautiful and true reflect associations. Although the entailments between beautiful and true is unidirectional in Experiment 2, it appeared to be bidirectional in Experiment 1; this remains to be clarified by future studies with a higher statistical power. What does non-extreme responses on a Likert scale mean, then, if a statement can only be either True or False? We think that non-extreme responses may reflect the *degree of belief* over the statements, which can be understood as expected truth value (Smith 2010). In other words, we can have beliefs such as "the beautiful is good *80%* of the times", which may be captured as a non-extreme response on Likert scales.

In sum, our current study provides complementary evidence to prior research on the "good is beautiful"

stereotype, both in methodology, sample, and in research question. Firstly, we provide one of the first studies that directly probed subjects explicitly of questions about the entailment of beautiful and good. Secondly, most prior studies on the "good is beautiful" stereotype were based on so-called WEIRD (Western, Educated, Industrialized, Rich and Democratic) populations (cf. Henrich et al. 2010). Over-reliance on WEIRD populations may not be able to provide us with the whole picture of human cognition, and may even also bias theory building in cognitive science and social science (Blasi et al. 2022). Our current sample from mainland China lays the ground for future cross-cultural and cross-language comparisons. Finally, we extend the research topic from "beautiful" and "good" to the even more mysterious notion of "true".

Declarations

Conflict of interest The authors declare that they have no conflicts of interest with respect to their authorship or the publication of this article.

Ethical approval The experiments were approved by the ethical committee of the School of Psychological and Cognitive Sciences at Peking University and were in accordance with the Declaration of Helsinki.

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