

CONJUNCTIVE EXPLANATIONS: ARE TWO REASONS BETTER THAN ONE FOR CHINESE PEOPLE?

John Leddo and Yiting Gu

MyEdMaster, LLC

John Leddo is the director of research at MyEdMaster, LLC.

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ABSTRACT

Leddo, Abelson & Gross (1984) reported that when explaining everyday events, people often found conjunctions of two explanations more compelling and, therefore, more likely than either explanation on its own. This constitutes a reasoning bias as a conjunction of two events can never be more likely than either of its component events. This conjunction effect for explanations has subsequently been replicated (cf. Abelson, Leddo and Gross, 1987; Leddo et al., 2020), demonstrating its robustness. These studies were all done with American Participants. Given our previous research testing other theoretical frameworks with other countries (cf. Boucher and Leddo, 2022; Gu and Leddo, 2022; Leddo et al., 2022; Tun et al., 2022), it raises the question as to whether conjunction effects for explanations would also be demonstrated in other countries. The present study replicates the original Leddo, Abelson & Gross (1984) study with Chinese Participants. Results showed that Chinese Participants exhibited conjunction effects with the same frequency as American Participants did, but the magnitude of the effects, and hence the magnitude of the bias, was much smaller. We discuss the desirability of investigating other well-documented judgment and decision making biases across diverse cultures in order to determine what similarities and differences exist across these cultures.

Introduction

There is a long research history of documenting judgment and decision biases, particularly those involving statements of probability (cf., Kahneman, Slovic and Tversky, 1982). Typically, these biases are manifested when people judge events to be far more likely than what can be statistically justified given the data presented regarding the event. Once such bias is the conjunction fallacy (Tversky and Kahneman, 1982, 1983), where people rate a conjunction of

two events to be more likely than each individual event. Such behavior is termed a fallacy, given that two events cannot mathematically be more likely to occur than either individual event.

In one of Tversky and Kahneman's classic examples, a woman named Linda is described as a single woman interested in social causes. People rate it more likely that she is a bank teller and a feminist than a bank teller. Given that all bank tellers are not necessarily feminists, the subset of women bank tellers who are also feminists cannot be greater than the set of all women bank tellers. However, since the label "bank teller" does not account for Linda's interest in social causes, that label seems somehow incomplete when it stands alone. On the other hand, since feminism is a social cause, adding the label feminist to the description of bank teller seems to account for more of the information given about Linda and is, therefore, judged to be more likely. To put it in terms that Tversky and Kahneman might otherwise use, a feminist is more "representative" (Tversky and Kahneman, 1982) of someone interested in social causes than bank teller is.

Leddo, Abelson and Gross (1984) demonstrated that conjunction effects can occur when people are explaining events. Noting Wilensky's (1983) observation that people typically have multiple goals when engaging in actions, Leddo et al. (1984) reasoned that conjunctions of reasons for people's actions might seem more compelling and hence be rated more likely than single reasons, even though mathematically, they cannot be more likely. Leddo et al.'s (1984) hypothesis was confirmed. In two experiments, participants were shown vignettes of a person engaging in goal-related activities and asked to rate the likelihood of specific explanatory factors and their conjunctions. For both commonplace and significant activities, for triple as well as simple conjunctions, for goal-based and precondition-based explanations, and for various average probability values, conjunctive explanations were assessed as more likely than one or more of their components.

Leddo and his colleague further replicated these findings in subsequent experiments (Abelson, Leddo and Gross, 1987; Leddo et al., 2020). This raises the interesting question of how general this conjunction effect is. It is often the case that documented social science-related findings fail to hold up in tests in other cultures (Heinrich, Heine, and Norenzayan, 2010). For example, when Leddo and his colleagues tested their reformulation (Leddo, Jayanti and Duan, 2019) of Kahneman and Tversky's Prospect Theory (1979) in other countries, they found that Japanese people behaved similarly to American people (Tun, Tun, Campbell and Leddo, 2022), but Nicaraguan (Boucher and Leddo, 2022) do not and Chinese (Gu and Leddo, 2022) people did in some situations but not in others.

Notably, Gu and Leddo (2022) found Chinese people to be more conservative in their decision making than American people. This raises the research question of whether Chinese people

might be less prone to show conjunction effects in rating explanations. Accordingly, the purpose of the present study was to replicate the original Leddo, Abelson and Gross (1984) study using Chinese participants.

Method

Participants

Participants were 22 native Chinese high school students living in China. However, all students were fluent English speakers. All students attended King's China International School in Shanghai. They were not paid for the participation.

Materials Used

A total of ten scenarios were used. Each scenario concerned mundane activities, followed by a character making a decision. After each scenario, the instructions asked the participant to explain the character's decision. There were five possible explanations given. Three were single reasons for why the decision was made. Of these, two were typical reasons why people might make the decision and one was an atypical one. The remaining two reasons were conjunctions of two reasons. The first conjunction contained the two typical reasons and the second conjunction contained one typical reason and the atypical reason. This was modeled after the original Leddo, Abelson and Gross (1984) study. The materials used in the present study are shown verbatim below.

Directions: In the following scenarios, you will be presented with a variety of realistic scenarios. After each scenario, you will be presented with potential reasons and asked to decide the probability about the likelihood that those events are explanations for what happened in the scenario. Please give a probability between 0% and 100% where 0% means that there is 0% probability that the events are explanations for the outcome of the scenario and 100% means that it is 100% certain that the events are explanations for the outcome of the scenario.

Scenario 1

Jane is an eighth grader at Stone Ridge Middle School. It's the beginning of the year and she just got assigned her locker. Jane wanted to know why her locker would jam so often so she could prevent it from happening in the future.

What is the probability that the following are among the reasons why Jane's locker jams:

- There are too many binders and books in her locker.

- The strap of Jane's big backpack gets stuck between the door and locker.
- Jane isn't able to open the lock on her locker.
- There are too many binders and books in her locker and the strap of Jane's big backpack gets stuck between the door and locker.
- Jane isn't able to open the lock on her locker and there are too many binders and books in her locker and they are getting stuck in the lock.

Scenario 2

It's the summer before Mark's eight-grade year and already he's having schedule conflicts. Mark signed up for French and also auditioned for band. The band teacher decides to put Mark into Level 2 band and the French teacher puts Mark in beginning French. Both Level 2 band and beginning French occur during third period. Mark can only take one class or else the rest of his schedule will be affected and thrown off. After thinking it over Mark decides to take French.

What is the probability that the following are among the factors that influenced Mark's decision to take French instead of band:

- French is a high school credit course.
- The school has a strong French program.
- Carrying a band instrument to and from school is a hassle.
- French is a high school credit course and the school has a strong French program.
- The school has a strong French program and carrying a band instrument to and from school is a hassle.

Scenario 3

Xavier was invited to a party. His mom does not know the host and she does not want him to go. Xavier tells his mom that the host is kind and she should trust him. He also says he really wants to go. Xavier decides he will sneak out of the house and go to the party.

What is the probability that the following are among the factors that influenced Xavier's decision to go to the party without his mom's permission:

- All of his friends are going to the party.

- He thinks he is old enough to make his own decisions.
- His favorite band will be performing at the party.
- All of his friends are going to the party and his favorite band will be performing at the party.
- He thinks he is old enough to make his own decisions and all of his friends are going to the party.

Scenario 4

Samantha went to the doctor for a physical check-up. The doctor told her that she gained twenty pounds since her last visit. After the check-up Samantha decides to go on a diet.

What is the probability that the following are among the factors that influenced Samantha's decision to go on a diet:

- All of the girls at Samantha's school are going on diets.
- Samantha doesn't want to be overweight.
- The doctor told Samantha to watch her weight.
- Samantha doesn't want to be overweight and the doctor told Samantha to watch her weight.
- All of the girls at Samantha's school are going on diets and Samantha doesn't want to be overweight.

Scenario 5

Matt is at the store buying a present for his friend's birthday later this week. He sees a popular video game for Xbox and decides it's the perfect gift. He purchases the video game and gives it to his friend.

What is the probability that the following are among the factors that influenced Matt's decision to buy the video game:

- Matt's friend loves to play Xbox.
- The game was made in America.

- Matt's friend had been waiting for the game to be released.
- The game was made in America and Matt's friend had been waiting for the game to be released.
- Matt's friend loves to play Xbox and Matt's friend had been waiting for the game to be released.

Scenario 6

Krystal's friends invited her to go to the mall with them to buy a new outfit for her birthday next month on the same night that her family was going out to dinner together to celebrate her dad's promotion. Krystal thinks it over and decides she would rather attend her dad's promotion dinner than go to the mall.

What is the probability that the following are among the reasons why Krystal decided to go to her dad's promotion dinner than with her friends to the mall:

- She wanted to show support for her dad's promotion.
- The restaurant serves Krystal's favorite dish.
- She could pick another day to go to the mall.
- The restaurant serves Krystal's favoritedish and she could pick another day to go to the mall.
- She wanted to show support for her dad's promotion and she could pick another day to go to the mall.

Scenario 7

David's dad is finally buying David a phone! His dad gives him a choice of either getting a touch screen phone or a slider. David decides to get a touch screen phone, instead of the slider.

What is the probability that the following are among the factors that influenced David's decision to buy a touch screen phone instead of a slider:

- All of David's friends have touch screen phones.
- A touch screen phone is easier to operate than a slider.
- The touch screen phone has more features than the slider does.

- A touch screen phone is easier to operate than a slider and the touch screen phone has more features than the slider does.
- All of David's friends have touch screen phones and the touch screen phone has more features than the slider does.

Scenario 8

Ben works for a technology company. He and his family live in New Jersey. Ben got offered a promotion that requires him to move to Hawaii. Ben talks over the promotion offer with his wife and children and decides against it.

What is the probability that the following are among the factors that influenced Ben decision to turn down the promotion:

- Ben's kids want to stay in their current school.
- Ben's family likes living in New Jersey.
- Ben's wife doesn't want to give up her current job.
- Ben's kids want to stay in their current school and Ben's family likes living in New Jersey.
- Ben's wife doesn't want to give up her current job and Ben's kids want to stay in their current school.

Scenario 9

Glenwood High School is looking for a new president to represent and lead the school's student council. The two candidates that are running are Kyle and Hannah. Both are doing well in the campaign, but Derek, a student at Glenwood, doesn't know whom to vote for. Finally it's time for the school to vote and after thinking it over, Derek decides to vote for Hannah.

What is the probability that the following are among the factors that influenced Derek to vote for Hannah instead of Kyle:

- Derek agrees more with Hannah's ideas on how to govern the school than with Kyle's.
- Derek thinks Hannah is more responsible than Kyle is.
- Derek has more shared interests with Hannah than with Kyle.

- Derek has more shared interests with Hannah than with Kyle and Derek agrees more with Hannah's ideas on how to govern the school than with Kyle's.
- Derek thinks Hannah is more responsible than Kyle is and Derek agrees more with Hannah's ideas on how to govern the school than with Kyle's.

Scenario 10

Jodie's parents are allowing Jodie to redecorate her room before school starts in fall. She painted her walls and bought new furniture to decorate her room in. Jodie also buys two types of wallpaper to put on one of the walls. One of the wallpapers has polka dots and the other has a floral pattern. Jodie decides to use the floral pattern instead of the polka dot wallpaper.

What is the probability that the following are among the factors that influenced Jodie's decision to chose the floral wallpaper instead of the polka dot one:

- Jodie thinks her friends will like the floral wallpaper more than the polka dot one.
- The floral wallpaper matches the paint color.
- Jodie likes how the floral wallpaper looks on the wall.
- The floral wallpaper matches the paint color and Jodie thinks her friends will like the floral wallpaper more than the polka dot one.
- Jodie likes how the floral wallpaper looks on the wall and the floral wallpaper matches the paint color.

Procedure

Subjects were run in small groups. Each story appeared on a separate page with the explanations listed below it in random order. In the explanations involving conjunctions, the explanation that appeared first was randomly determined. The order of the ten stories was randomized for each subject. As described in the Materials section above, Participants were asked to rate the likelihood, on a scale of 0% to 100%, that each potential explanation was the explanation for the character's decision.

Results

A conjunction effect occurs when a Participant rates a conjunction of reasons as more likely than either of the component reasons. Given that there were 10 scenarios presented to each Participant and each scenario had two explanations that each contained a conjunction of two

reasons, there were 20 opportunities for each participant to exhibit a conjunction effect when rating the likelihood of conjoint reasons. Since there were a total of 22 Participants, this means that there were 440 opportunities across Participants to exhibit conjunction effects.

Mathematically, the correct number of times a conjunction effect should occur is 0. As with the original Leddo, Abelson and Gross (1984) study, there were no differences in occurrences of conjunction effects between typical reason plus typical reason vs. typical reason plus atypical reason. Therefore, these data were collapsed in the analysis.

Of 440 opportunities to show conjunction effects, Participants did so 322 times and did not 118 times. These amount to showing conjunction effects 73.2% of the time, which was very close to the 76% rate of conjunction effects found in the original Leddo, Abelson and Gross (1984) study.

There was a notable difference between the results of the Leddo, Abelson and Gross data and the present data. Leddo, Abelson and Gross reported average likelihood ratings for individual typical reasons in the mid-60's and average likelihood ratings for conjunctions of typical reasons in the high-70's, suggesting that a conjunction of typical reasons is perceived as even more likely than each individual reason. They reported average likelihood ratings for individual atypical reasons in the mid-20's and average likelihood ratings for conjunctions of typical and atypical reasons in the mid-40's, suggesting that a conjunction of typical and atypical reasons is perceived as the average of the individual reason likelihoods.

This pattern did not hold in the responses of the Chinese Participants. Rather, likelihood ratings for both individual and conjunctions of reasons were typically in the 10% to 30% range with averages close to 20%. Therefore, overall, Chinese Participants were much more conservative in their likelihood ratings than were their American counterparts. This finding is consistent with our other research comparing decision making of Chinese to US people (Gu and Leddo, 2022). The other implication associated with this finding is that, even though Chinese Participants demonstrated conjunction effects with equal frequency to their US counterparts, the magnitude of the conjunction effects was very small. Overall, the average likelihood ratings of individual reasons for Chinese Participants was 19.7% (with typical and atypical reasons being rated virtually the same), and the average likelihood ratings of conjoint reasons for Chinese Participants was 20.5% (with typical plus typical vs typical plus atypical ratings being virtually the same). In other words, when Chinese Participants exhibited conjunction effects, these were usually in the range of 1-2%.

Discussion

The present study replicated, on Chinese Participants, the original Leddo, Abelson and Gross (1984) findings that, when people explain events, a conjunction of reasons seems more likely

than individual reasons. There was one important caveat. While the magnitude of conjunction effects was large with American Participants, they tended to be very small with Chinese Participants. This seems to be reflective of an overall conservativeness on the part of Chinese people to claim certainty in uncertain situations. Not only was the size of the conjunction effects smaller in Chinese Participants compared to their American counterparts, but the overall likelihood ratings were substantially smaller as well.

This latter result adds an interesting wrinkle to the Heinrich et al. (2010) conclusion that findings in one culture often do not hold in other countries. In our previous work (Gu and Leddo, 2022) that tested our reformulation of Kahneman and Tversky's Prospect Theory (1979) with Chinese Participants, we found that our predictions were confirmed for decisions involving losses but not for decisions involving gains. This represented a qualitative departure from what was predicted by our theory. On the other hand, in the present study, we found conjunction effects to be just as prevalent in Chinese Participants as they were in US Participants as reported in the original Leddo, Abelson and Gross (1984) study. The primary difference in the two cases was quantitative, not qualitative. Chinese Participants were just as likely to show conjunction effects but the magnitude of these effects and the overall probability ratings were much smaller.

This raises interesting questions about what other similarities and differences might there be in judgment and decision making between US and Chinese people and whether the differences are likely to be qualitative or quantitative. For example, a very widely documented decision making bias is that of overconfidence (cf. Dunning et al., 1990) where people give probability ratings that are much higher than those warranted by the decision parameters. Given our and other research suggests Chinese people tend to be more cautious/conservative than Americans, we might expect the overconfidence bias to be smaller in Chinese people than in American people. One might even wonder if Chinese people might exhibit an underconfidence bias and be less confident than warranted.

Given that much of the research in judgment and decision making biases originated with Western scientists and were done on samples of Western Participants from industrialized nations, a systematic replication of these investigations on people from diverse countries may yield fascinating results and provide insights into people from around the world reason and make decisions.

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