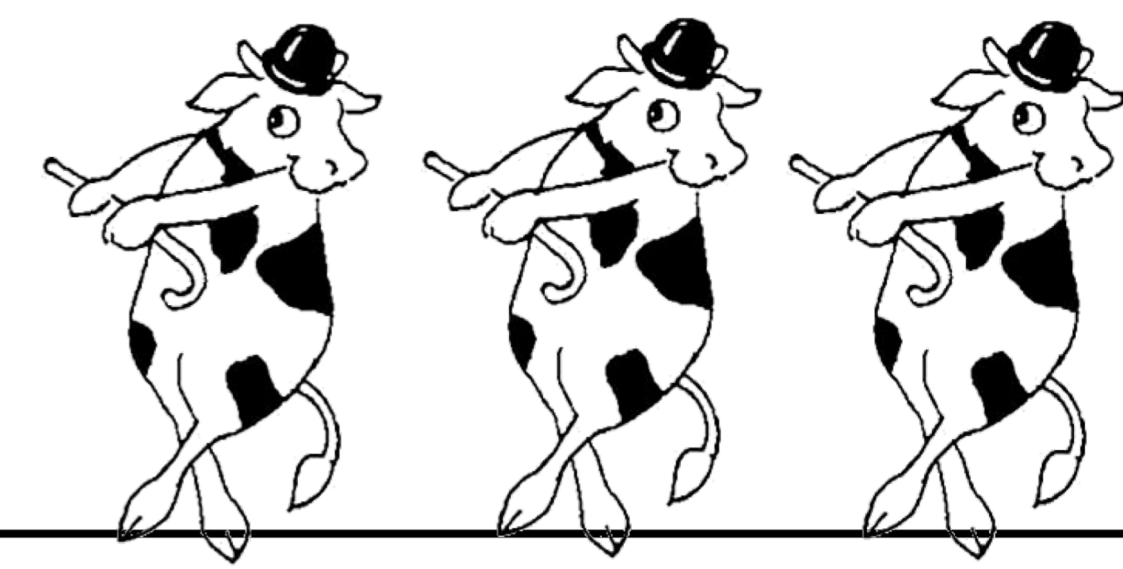# The Plausible Impossible:
Graded Notions of Impossibility Across Cultures

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Introduction

- ❖ Acts of imagination are fanciful. We are able to imagine events that have not occurred and could never occur in reality. 🪁

- ❖ Shtulman and Morgan (2017) showed that people honor causal constraints in their imaginative activities, even when those constraints are logically precluded by the events under consideration.

- ❖ We investigated the cross-cultural consistency in how people reason about magical events by replicating Shtulman and Morgan's (2017) spell-judgment experiments in a Chinese sample.

- ❖ Graded notions of impossibility may be specific to Westerners given their emphasis in Western fantasy or because Westerners are more likely to adopt an analytic thinking style, decomposing even impossible events into component parts.

- ❖ On the other hand, Easterners and Westerners share similar causal expectations and may overapply these expectations when reasoning about non-causal events.

Conclusion

- ❖ Chinese adults also use real-world causal knowledge to interpret magical events, even when that knowledge should be irrelevant.

- ❖ **Graded notions of impossibility appear to be shared by Easterners and Westerners alike**, possibly because they are a byproduct of causal knowledge.

🔙 Download the full paper

Gong, T., & Shtulman. A.(2020). The plausible impossible: Graded notions of impossibility across cultures. In *Proceedings of the 42nd annual conference of the cognitive science society*.

http://sites.oxy.edu/shtulman/documents/2020d.pdf

Study 1 & 2

Participants

- 150 undergraduate or graduate students in China participated in Study1A, 1B, and 2, with fifty for each.

Design & Procedure

- Study 1A: Participants were asked to do the binary selection of **which spell in each pair** would be more difficult to learn.

- Study 1B: Participants were asked which spell in each pair would be more difficult to learn and were given the option of selecting "equally difficult".

- Study 2: Participants made the same judgments as in Study 1B but also provided an explanation for their choices.

Baseline: .50 .33 .33

Spell	(Hidden)	Causal constraint	Study 1A	Study 1B	Study 2
Making a (bush, tree) invisible 让 (灌木丛, 树木) 隐形	🌲	Object size	.76*	.54*	.66*
Making a (basketball, bowling ball) float in the air 让 (篮球, 保龄球) 漂浮在空中		Object weight	.84*	.46*	.58*
Turning a broom into a (shovel, bucket) 把扫帚变成 (铲子, 桶)	🪣	Object shape	.88*	.32	.42
Shrinking a (chair, computer) to half its size 将 (椅子, 电脑) 缩小成原先的一半	💻	Object complexity	.68*	.28	.52*
Walking through a wall made of (wood, stone) 穿过由 (木头, 石头) 制成的墙壁	🎒	Object density	.90*	.68*	.50*
Turning a lump of coal into a lump of (silver, gold) 把一块煤变成一块 (银, 金)	🥇	Object value	.68*	.24	.30

Physics: .79*** .42* .50***

Spell	(Hidden)	Causal constraint	Study 1A	Study 1B	Study 2
Turning a person into a (monkey, pig) 把一个人变成一只 (猴子, 猪)	🐷	Evolutionary similarity	.68*	.16	.32
Turning an adult back into a (teenager, child) 把一个成年人变回 (青少年, 儿童)	👶	Developmental similarity	.74*	.38	.52*
Curing a person's (hiccups, arthritis) 治愈一个人的 (打嗝, 关节炎)	🦴	Ailment severity	.80*	.80*	.76*
Mending a broken (finger, arm) 修复一个断掉的 (手指, 手臂)	💪	Organ size	.76*	.60*	.60*
Growing an extra (toe, eye) 长出一只额外的 (脚趾, 眼睛)	👀	Organ complexity	.92*	.50*	.74*
Making a person's (hair, teeth) grow longer 让一个人的 (头发, 牙齿) 变长	🦷	Organ plasticity	.94*	.80*	.86*

Biology: .81*** .54*** .63***

Spell	(Hidden)	Causal constraint	Study 1A	Study 1B	Study 2
Making a person forget his own (phone number, name) 让一个人忘记自己的 (手机号, 名字)	"Tia"	Knowledge entrenchment	.86*	.64*	.74*
Teaching a monkey to do (arithmetic, calculus) 教猴子做 (算数, 微积分)	∫ f(x) dx.	Knowledge complexity	.92*	.72*	.92*
Teaching a cow how to (skip, tap dance) 教奶牛 (跳跃, 踢踏舞)	💃	Skill difficulty	.78*	.70*	.86*
Making someone (smile, laugh) 让一个人 (微笑, 狂笑)	😂	Affect intensity	.50	.48*	.42
Increasing a person's (memory, intelligence) 增加一个人的 (记忆力, 智力)	🙂	Trait stability	.76*	.64*	.58*
Teaching a person to (read, speak) a foreign language 教一个人 (阅读, 说) 一门外语	💬	Language comprehension	.62	.50*	.52*

Psychology: .74*** .61*** .67***

*: *p*<0.05; ***: *p*<0.001

Results

- Study 1A: Participants' judgments aligned with the spells' implicit causal ordering 78% of the time ($t(49) = 12.73$, $p < .001$).

- Study 1B: Participants' judgments aligned with the spells' implicit causal ordering 52% of the time ($t(49) = 5.96$, $p < .001$); they were more likely to select the extreme option than the "equally difficult" option ($t(49) = 2.49$, $p < .05$).

- Study 2: Participants' judgments aligned with the spells' implicit causal ordering 60% of the time ($t(49) = 8.78$, $p < .001$); when they gave the anticipated answer, they cited the target constraint in their explanation 72% of the time.

- Item-level correlations between the current studies and the studies from Shtulman and Morgan (2017) were $r = .31$ for Study 1A, $r = .50$ for Study 1B, and $r = .64$ for Study 2.

Study 3

Participants

- 116 undergraduate or graduate students in China participated.

Design & Procedure

- Participants were asked to generate their own examples of introductory, intermediate, and advanced spells, respectively, using nine frames.

% answers were blindly coded as aligned with hidden causal constraints (all were greater than that expected by chance: 17%)

Spell	(Hidden)	Causal constraint	Sample responses		
Making a ___ float in the air (object) 让___悬浮在空中 (物体)		Weight	Coin Car Building	Ping-pong ball Television Car	78%
Predicting when the next ___ will occur (event) 预测下一次___何时发生 (事件)		Probability	Network drop Lottery win Mass extinction	Ball game Earthquake Doomsday	56%
Turning ___ into gold (material) 把___变成黄金 (物质)		Density	Silver Bronze Wood	Copper Iron Stone	53%
Teleporting a package from Beijing to ___ (location) 把一个包裹从北京瞬移到___ (地点)		Proximity to Beijing	Shanghai Himalaya Mars	Shandong Shanghai Hong Kong	86%
Enchanting a person to like ___ (food) 迷惑一个人喜欢上吃___ (食物)		Disgustingness	Dessert Sour food Grass	Garlic Raw meat Soil	50%
Bringing a dead ___ back to life (animal) 让死去的___回生 (动物)		Size	Rat Dog Tiger	Jellyfish Cat Human	61%
Conjuring a ___ out of thin air (object) 凭空造出一个___ (物体)		Size	Bubble Bread Building	Money House Nation	49%
Making a potion that cures ___ (disease) 制作治疗___的药水 (疾病)		Severity	Scratch Myopia Cancer	Cold Appendicitis AIDS	70%
Hexing a person to lose their ___ (possession) 施法让一个人失去他的___ (拥有的东西)		Personal value	Toy Hair Eyesight	Ornament Money Intelligence	59%

Reference

Shtulman, A., & Morgan, C. (2017). The explanatory structure of unexplainable events: Causal constraints on magical reasoning. *Psychonomic bulletin & review*, 24(5), 1573-1585.