

The Effect of Temporal Focus on Implicit Space-Time Mapping in the Front-Back Direction: Evidence from Han and Qiang Ethnic Groups (Post-print)

Authors: Li Heng, Cao Yu

Date: 2018-09-07T00:00:00+00:00

Abstract

Employing different research methods, this study investigated the association direction of implicit space-time mapping and its influencing factors among Han and Qiang participants. Experiment 1 utilized a timeline chart task and found that Han participants showed no significant preference between the two types of implicit space-time mapping—“past in front” and “future in front”—whereas Qiang participants exhibited a stronger tendency to use the “past in front” mapping. Since both groups use the Chinese language, yet their implicit space-time mappings differ, this demonstrates a dissociation between temporal language and temporal thinking. Experiment 2 employed a Time Focus Scale to examine the degree of attention Han and Qiang participants paid to past and future time. The results revealed that the former showed comparable attention levels to past and future, while the latter displayed stronger “past-oriented thinking,” indicating that cultural preferences in temporal focus can effectively predict their implicit space-time mapping. Experiment 3 used a temporal concept classification task and found that implicit space-time mapping facilitated the representation and processing of temporal concepts for both Han and Qiang participants, producing a “metaphorical consistency effect.” The overall study demonstrates that individuals’ attitudes toward time in Han and Qiang cultures can determine the association direction of their implicit space-time mapping, supporting the “Temporal Focus Hypothesis.”

Full Text

The Influence of Temporal Focus on Implicit Space-Time Mappings on the Front-Back Axis: Evidence from Han and Qiang Chinese

LI Heng¹, CAO Yu²

(¹ College of Foreign Languages and Cultures, Xiamen University, Xiamen 361005, China)

(² School of Foreign Languages, Zhongnan University of Economics and Law, Wuhan 430073, China)

Abstract

This study investigated the directionality of implicit space-time mappings and its influencing factors among Han and Qiang Chinese participants using different methodological approaches. Experiment 1 employed a time diagram task and found that Han participants showed no significant preference between “past-in-front” and “future-in-front” mappings, whereas Qiang participants demonstrated a stronger tendency to use the “past-in-front” mapping. Since both groups used Mandarin Chinese but exhibited different implicit space-time mappings, this suggests a dissociation between temporal language and temporal thought. Experiment 2 utilized a Temporal Focus Scale to assess the degree of attention participants paid to past and future times. The results revealed that Han participants allocated comparable attention to past and future, while Qiang participants exhibited stronger “past-oriented thinking,” indicating that cultural preferences for temporal focus can effectively predict their implicit space-time mappings. Experiment 3 used a time concept classification task and found that implicit space-time mappings facilitated the representation and processing of temporal concepts for both Han and Qiang participants, producing a “metaphoric congruency effect.” Overall, the findings demonstrate that individuals’ attitudes toward time in Han and Qiang cultures determine the directionality of their implicit space-time mappings, supporting the Temporal Focus Hypothesis.

Keywords: Han Chinese; Qiang Chinese; implicit space-time mappings; temporal focus; conceptual metaphor

Classification Number: B842

1. Introduction

Conceptual Metaphor Theory posits that metaphor constitutes a fundamental mode of human thinking and an essential cognitive mechanism for representing abstract concepts (Lakoff & Johnson, 2003). Mechanistically, metaphor involves systematic mapping from a concrete source domain to an abstract target domain (Kövecses, 2015; Landau, Robinson, & Meier, 2013). Linguistic research indi-

cates that space-time metaphors exist across numerous cultures and languages, where spatial concepts serve as the source domain and temporal concepts as the target domain, forming various types of space-time mapping relations (Gijssels & Casasanto, 2017; Moore, 2014).

Psychologists have discovered that the mapping relationship between time and space exists not only in explicit linguistic expressions but also in people's mental cognition, with the latter commonly referred to as "implicit space-time mappings" (Casasanto, 2016, 2017; Casasanto & Jasmin, 2012; Li & Cao, 2017). Regarding the factors influencing the directionality of implicit space-time mappings, two primary perspectives currently exist: the "Metaphor Structure View" and the "Temporal Focus Hypothesis." Early research largely supported the Metaphor Structure View, suggesting that people's implicit space-time mappings are primarily influenced by linguistic expressions (Boroditsky, 2000). Specifically, speakers consciously establish space-time mappings in their mental and cognitive frameworks that align with the explicit space-time relations encoded in their language. For example, Boroditsky (2001) found that Mandarin speakers exhibited stronger vertical temporal metaphors than English speakers, manifesting an implicit space-time mapping of "past is up, future is down." This was attributed to the greater number of vertical temporal metaphors in Mandarin. Some recent studies even suggest that language plays a causal role in forming implicit space-time mappings. Hendricks and Boroditsky (2017) conducted short-term temporal language training with English speakers, who lack vertical temporal metaphors, using expressions like "breakfast is above dinner" that imply "past is up, future is down." After a period of training, participants indeed formed corresponding space-time mappings in their implicit temporal cognition, responding faster to images representing earlier times when presented at the top of the screen and to images representing later times when presented at the bottom.

Although the Metaphor Structure View has received substantial empirical support, recent studies have found that explicit space-time mappings in language do not always align with implicit space-time mappings in cognition, sometimes even showing dissociation. People frequently produce unconscious co-speech gestures when speaking. Psychologists consider temporal gestures an important window into implicit space-time metaphorical mappings (Casasanto & Jasmin, 2012; Li, 2017; Walker & Cooperrider, 2016; Li, 2016). De la Fuente, Santiago, Román, Dumitrache, and Casasanto (2014) found that although Moroccan Darija, like Spanish, primarily encodes "future is front, past is back" mappings in linguistic expression, its co-speech gestures revealed the opposite mapping relationship. This suggests that temporal language may not be the sole determinant of temporal thinking patterns.

To further investigate the implicit space-time mappings of Spaniards and Moroccans, de la Fuente et al. (2014) designed a time diagram task. The experimental results were largely consistent with the gesture study findings. The researchers observed that Spaniards tended to place objects representing "future" in front

of their bodies and objects representing “past” behind them. In contrast, Moroccans tended to place objects representing “past” in front of their bodies and objects representing “future” behind them, indicating that they primarily used a “past-in-front, future-in-back” implicit space-time mapping that directly contradicted the space-time mapping used in their language.

Since language could not explain the dissociation between temporal language and temporal thought in Moroccans, de la Fuente et al. (2014) proposed the “Temporal Focus Hypothesis,” suggesting that differences in individuals’ attention to past and future times constitute the primary cause of cross-cultural diversity in implicit space-time mappings. Specifically, people may allocate different degrees of attention when perceiving past and future events. These differences in attentional weight can fundamentally influence the directionality of implicit space-time mappings. For instance, individuals who attend to the past are more likely to form “past-in-front” implicit space-time mappings, whereas those who attend to the future are more likely to form “future-in-front” mappings. This correspondence can be explained through embodied cognition theory, which posits that the body is a crucial factor shaping cognition (Barsalou, 1999, 2016; Lakoff & Johnson, 1999; Ye, 2011). Based on everyday experience, people tend to allocate more attention to things of greater importance, such as placing them in visible positions in front of the body to avoid losing them. Consequently, temporally salient events are more likely to become associated with the front spatial orientation, forming specific space-time metaphorical mappings.

To test this hypothesis, the researchers examined the cultural attitudes of Moroccans and Spaniards toward past and future times using a “Temporal Focus Questionnaire.” The results showed that Moroccans value the past, cherish traditional ways of life, are steadfast inheritors of past cultural customs, and exhibit strong “past-oriented thinking.” Spaniards emphasize future-related matters and focus on social, economic, and technological development, demonstrating strong “future-oriented thinking.” Based on the combined results of both experiments, the researchers proposed that the directionality of people’s implicit space-time metaphorical mappings is primarily determined by cognitive agents’ temporal focus. Specifically, “past-oriented thinking” is more likely to lead to the formation of “past-in-front” implicit space-time mappings, while “future-oriented thinking” is more likely to lead to “future-in-front” mappings.

A few studies have also examined the explanatory power of the Temporal Focus Hypothesis in Chinese culture. Gu, Zheng, and Swerts (2016) investigated the implicit space-time mappings of mainland Chinese participants using a time diagram task. The results indicated that, compared to Spanish participants in de la Fuente et al.’s (2014) study, Mandarin speakers preferred to use “past-in-front” mappings. Gu et al. (2016) further cited Ji, Guo, Zhang, and Messervey (2009), arguing that Chinese people, influenced by Confucian thought, place greater emphasis on traditional culture and exhibit stronger “past-oriented thinking,” thereby supporting the Temporal Focus Hypothesis. However, it should be noted that Ji et al.’s study only focused on Chinese people’s nostalgia and

did not examine participants' attention to future times (e.g., whether it was lower than their attention to past times). More importantly, Gu et al.'s (2016) Chinese participants actually showed no significant difference in their choice between the two front-back temporal metaphor patterns (36.8% vs. 63.2%, $p = 0.14$ by Sign Test). A subsequent study on young, non-pregnant Chinese women similarly found that participants showed no significant preference for either implicit space-time mapping in the time diagram task and exhibited equal attention to past and future times, providing cross-cultural evidence for the Temporal Focus Hypothesis (Li & Cao, 2018). However, it should be pointed out that China is a multi-ethnic country, and the aforementioned studies largely treated Chinese participants as a homogeneous group, making it difficult to accurately reflect the uniqueness of each ethnic group's temporal metaphor system and its speakers' implicit temporal cognitive patterns.

Extensive research has found that during long historical evolution, the living environments and life experiences of different ethnic groups may create unique space-time metaphor systems. For example, Song and Zhang (2016) discovered that Mongolian expressions for "year" are primarily associated with grass, as Mongolians have traditionally engaged in animal husbandry and grassland is crucial for herd survival. In contrast, Tibetan Sign Language expresses "spring" and "winter" using gestures for "frozen soil + melting" and "frozen soil + freezing hard," respectively. This is because agriculture holds significant weight in Tibet's economic structure, and as one of China's largest permafrost distribution areas, the degree of permafrost melting directly affects agricultural production activities (Li, Wu, & Wugen, 2013).

Previous research indicates that the concept of "respecting elders" is deeply rooted in Qiang culture through long-term historical development. Respecting the elderly constitutes a fundamental behavioral norm for the Qiang people that must not be violated (Xu, 2006). For instance, during festive occasions or when entertaining guests at a "zajiu" (fermented barley wine) ceremony, Qiang people typically have elders deliver opening speeches first to receive divine blessings, then seat themselves according to generational rank, age, and host-guest status. Even when encountering elders in daily life, they must address them respectfully and step aside to yield the way. During ceremonial dances, elders often lead the singing and dancing while others follow. From the perspective of temporal focus, Qiang culture appears similar to Moroccan culture in de la Fuente et al.'s (2016) research, exhibiting clear "elder-respecting" characteristics. Researchers believe this feature primarily reflects a psychological-cognitive orientation of cherishing tradition and emphasizing inheritance. Based on this inference, Qiang people, deeply influenced by the ideology of "respecting elders" rather than "cherishing the young," should, like Moroccans, pay more attention to past times and exhibit strong "past-oriented thinking." In contrast, although "respecting elders" is a traditional Chinese virtue, as the ancient saying goes, "extend respect for one's own elders to others' elders," and modern society also advocates giving up seats to the elderly on subways and buses, for Han Chinese, "respecting elders" is primarily a moral virtue and civil etiquette that largely

relies on individual consciousness rather than mandatory social norms. Therefore, Han Chinese should exhibit less attention to past times than Qiang people. Moreover, while Han Chinese “respect elders,” they also “cherish the young,” as children and youth represent family hope and national future. Thus, it can be hypothesized that Han Chinese should show equal attention to past and future times. From a psychological perspective, evidence shows that the social custom of “respecting elders” indeed has significant impacts on Qiang people’s cognitive psychology. For example, Li, Zhang, and Zhang (2014) investigated semantic processing of kinship terms and found that Qiang participants responded faster and with lower error rates to kinship terms of higher generational status than to those of lower status. The researchers argued that this primarily relates to the asymmetric attitudes toward elders and children in Qiang culture, providing empirical evidence for the psychological reality of Qiang people’s strong “elder-respecting” concept.

According to ethnic language surveys, although the Qiang people have their own language, their writing system has been lost. Approximately 120,000 people speak Qiang (self-identified as “Rima”), primarily concentrated in Mao County, Wenchuan, and Songpan in the Aba Tibetan and Qiang Autonomous Prefecture of Sichuan Province. However, it should be noted that except for middle-aged and elderly people (including some middle-aged individuals), fewer and fewer Qiang youth can speak Qiang, providing an ideal population for examining the Metaphor Structure View and Temporal Focus Hypothesis. According to the Metaphor Structure View, if language is the primary factor shaping people’s temporal cognition, it can be predicted that Qiang and Han Chinese, influenced by Mandarin’s space-time metaphors, should exhibit consistent implicit space-time mappings. Conversely, if temporal focus is the primary factor influencing implicit space-time mappings, it can be predicted that Qiang and Han Chinese should differ in their implicit space-time mappings, with the former paying more attention to past times and thus showing stronger preference for “past-in-front” implicit space-time mappings. Based on these considerations, this study conducted three experiments to investigate the implicit space-time mappings and temporal focus of Han and Qiang Chinese and to compare the explanatory power of the Metaphor Structure View and Temporal Focus Hypothesis.

2. Experiment 1: The Directionality of Implicit Space-Time Mappings in Han and Qiang Chinese

To ensure research reliability and reduce random error, Experiment 1 adopted a large sample size, primarily referencing de la Fuente et al.’s (2016) study. Han participants were 102 high school students (53 males, 49 females) from two middle schools in Guang’an City, Sichuan Province, aged 15-18 years ($M = 15.7$). Qiang participants were 99 high school students (45 males, 54 females) from two middle schools in Danba County and Pingwu County, Sichuan Province, aged 15-19 years ($M = 16.1$). Both Han and Qiang participants attended public high

schools with similar educational backgrounds, spoke Mandarin as their native language, and Qiang participants did not know the Qiang language. Before the formal experiment, participants rated their Mandarin proficiency and usage frequency on a 5-point scale (1 = very unproficient/very infrequent, 5 = very proficient/very frequent). *t*-tests indicated no significant differences between the two groups on either measure ($t_{\text{proficiency}(199)} = 1.07$, $t_{\text{frequency}(199)} = 1.23$, $p_s > 0.05$). All participants had normal or corrected-to-normal vision and were right-handed.

2.2 Design

A 2 (participant type: Han/Qiang) \times 2 (space-time mapping type: past-in-front, future-in-back/future-in-front, past-in-back) mixed factorial design was used. Participant type was a between-subjects factor, and space-time mapping type was a within-subjects factor. The dependent variable was the proportion of participants selecting each space-time mapping type.

2.3 Materials and Procedure

We adopted the time diagram task from de la Fuente et al.'s (2014) Experiment 1 (as shown in Figure 1 [Figure 1: see original paper]), administered as a paper-and-pencil test. Due to its covert experimental purpose and simple operation, this task has become an important paradigm for investigating implicit space-time metaphorical mappings and has been widely used in numerous studies (Gu et al., 2016; Li & Cao, 2017, 2018).

The test material consisted of a cartoon character and two squares, with one square directly above and one directly below the character. Participants first read a short story: the cartoon character visited a friend who loved plants (animals) yesterday and would visit a friend who loved animals (plants) tomorrow. They were asked to write “plant” (represented by “植”) and “animal” (represented by “动”) in the appropriate squares (the correspondence between plant/animal and yesterday/tomorrow and the presentation order were counterbalanced across participants). In this experiment, the spatial positions of objects corresponded to time, but no cues directly indicated this relationship, effectively preventing participants from using linguistic space-time metaphors to guide their responses. Thus, the task could effectively probe participants' implicit space-time metaphorical mapping directions. Participants were instructed to respond quickly based on intuition and not to change their answers. They were informed that there were no right or wrong answers, discussion was not allowed, and they did not need to provide their real names.

2.4 Results and Analysis

Post-experiment interviews indicated that all participants understood the task but did not guess its true purpose, so all data were valid. The numbers and

percentages of Han and Qiang participants selecting each implicit space-time mapping are shown in Table 1 .

A Fisher' s exact test on the 2×2 contingency table revealed a significant interaction between participant type and space-time mapping direction, $\chi^2(1) = 27.06$, $p < 0.001$. This indicated that Han and Qiang participants differed significantly in their selection of the two space-time mapping types. Further Sign test analysis showed that Han participants' proportion of placing past-time objects in front (44.1%) did not differ significantly from their proportion of placing future-time objects in front (55.9%), $p = 0.28$. In contrast, Qiang participants' proportion of placing past-time objects in front (79.8%) was significantly higher than their proportion of placing future-time objects in front (20.2%), $p < 0.001$.

3. Experiment 2: Temporal Focus Preferences in Han and Qiang Chinese

3.1 Participants

Same as Experiment 1.

3.2 Design

A 2 (participant type: Han/Qiang) \times 2 (temporal focus type: past/future) mixed factorial design was used. Participant type was a between-subjects variable, temporal focus type was a within-subjects variable, and the dependent variable was participants' ratings of statements concerning different temporal foci.

3.3 Materials and Procedure

We used Shipp, Edwards, and Lambert's (2009) "Temporal Focus Scale" to examine Han and Qiang participants' attention to past and future times. Experiment 2 did not adopt de la Fuente et al.' s (2014) "Temporal Focus Questionnaire" because the researchers had not validated its reliability and validity, making it difficult to apply directly to other cultural groups. Moreover, some items in that questionnaire may not concern temporal focus but rather political orientation (e.g., liberal or conservative), such as "I think globalization is positive." Liu and Zhang' s (2016) research demonstrated that the "Temporal Focus Scale" can effectively measure Chinese people' s attention to past and future times and distinguish different temporal foci. The Chinese version of the Temporal Focus Scale was translated from the English version by two English teachers to ensure cultural and semantic equivalence. The questionnaire contained 12 statements related to "past" (4 items), "present" (4 items), and "future" (4 items), such as "I replay memories of the past in my mind" (past focus), "I live my life in the present" (present focus), and "I imagine what tomorrow will bring for me" (future focus).

After completing the time diagram task in Experiment 1, participants responded to the Temporal Focus Scale. They were instructed to read each statement carefully and rate it on a 7-point scale according to their own situation (1 = never, 3 = sometimes, 5 = often, 7 = always). After all participants completed the items, the questionnaires were collected. Data were processed using SPSS 20 software.

3.4 Results and Analysis

The mean scores of Han and Qiang participants on past and future items are presented in Table 2. Repeated measures ANOVA revealed a significant main effect of temporal focus type, $F(1, 199) = 14.43$, $p = 0.001$, $\eta^2_p = 0.06$. The main effect of participant type was not significant, $F(1, 199) = 1.03$, $p = 0.313$. The interaction between participant type and temporal focus type was significant, $F(1, 199) = 31.51$, $p < 0.001$, $\eta^2_p = 0.14$. Simple effects analysis indicated that Qiang participants' ratings for past items (5.45) were significantly higher than for future items (4.48), $p < 0.001$, and their ratings for past items were also higher than those of Han participants (4.95), $p < 0.001$. Han participants showed no difference in ratings between future and past items, $p = 0.11$, but their ratings for future items (5.19) were higher than those of Qiang participants (4.48), $p < 0.001$. The differences between Han and Qiang participants' scores on present-focus items were not significant and were unrelated to our hypotheses, so no further analysis was conducted. These results indicate that Han people showed no clear preference for "past-oriented" or "future-oriented" temporal thinking, whereas Qiang participants exhibited strong "past-oriented" temporal thinking, consistent with previous ethnological and anthropological research findings (Han, 2014; Chen, 2015).

4. Experiment 3: Metaphoric Congruency Effect in Han and Qiang Chinese

4.1 Participants

Experiment 3 participants were from the same source as Experiment 1. Thirty-six Qiang high school students (19 males, 17 females) from two public middle schools in Danba County and Pingwu County, Sichuan Province, aged 15-18 years ($M = 15.9$), and 42 Han high school students (18 males, 24 females) from two public middle schools in Guang'an City, Sichuan Province, aged 15-18 years ($M = 16.3$). All participants spoke Mandarin as their native language, had normal hearing and vision, and were right-handed. Before the formal experiment, participants rated their Mandarin proficiency and usage frequency on a 5-point scale (1 = very unproficient/very infrequent, 5 = very proficient/very frequent). t -tests indicated no significant differences between the two groups on either measure ($t_{\text{proficiency}(76)} = 0.79$, $t_{\text{frequency}(76)} = 1.23$, $ps > 0.05$). To

avoid cross-experiment interference, none of the participants had taken part in Experiment 1.

4.2 Design

A 2 (participant type: Han/Qiang) \times 2 (response type: congruent/incongruent) mixed factorial design was used. Participant type was a between-subjects factor, response type was a within-subjects factor, and the dependent variables were participants' reaction times and accuracy rates in judging the positions of temporal words.

4.3 Materials

The experimental materials consisted of 60 temporal words, with 30 expressing past times (e.g., “yesterday”) and 30 expressing future times (e.g., “tomorrow”). All temporal words were free of spatial morphemes (e.g., “front” or “back”) to avoid spatial word interference with experimental results. To ensure participants' judgments were not affected by word familiarity, 60 high school students who did not participate in the experiment (30 Han and 30 Qiang) rated the familiarity of the temporal words on a 7-point scale (1 = very unfamiliar, 7 = very familiar). The results indicated that both Han and Qiang participants rated the familiarity of past and future words above 6, with no significant differences (Han: $t(28) = 0.67$, $p = 0.82$; Qiang: $t(28) = 0.47$, $p = 0.68$). No significant differences existed between the two groups (past words: $t(58) = 0.76$, $p = 0.45$; future words: $t(58) = 0.82$, $p = 0.42$).

A native Mandarin speaker recorded the temporal words at normal speaking speed. Recordings were collected using Cool Edit Pro software with a noise-reduction microphone at a sampling rate of 44.1 kHz. After post-processing, the onset and offset of each temporal word audio were set to 100 ms before and after the word's pronunciation. The 60 temporal words were randomly divided into two blocks, each containing 15 past words and 15 future words. The temporal word position types were matched across the two blocks, including congruent and incongruent conditions.

4.4 Procedure

Based on Experiment 1's finding that Qiang participants tended to use a “past-in-front, future-in-back” mapping, we defined the congruent condition as “past-in-front/future-in-back” and the incongruent condition as “future-in-front/past-in-back” for convenience in Experiment 3. Congruent and incongruent types were balanced across the two blocks. Each participant completed both blocks. Within each block, the presentation order of temporal words was randomized, but past and future words alternated.

We used an auditory temporal word classification task. The experiment was conducted in a quiet room and programmed using Psychtoolbox based on MATLAB software on a Lenovo desktop computer. Temporal word classification was

implemented through keyboard responses using an 87-key wireless mechanical keyboard. To ensure data accuracy and prevent accidental key presses, only the “A,” “G,” and “L” keys were retained, with other keycaps removed. During testing, the keyboard was rotated horizontally by 90° and placed vertically, with the “L” key at the front, “G” key in the middle, and “A” key at the back. The “G” key controlled audio playback, while the “L” and “A” keys served as response keys. Participants were required to continuously hold the “G” key to play the temporal word audio until making a keypress response. The interval between releasing the “G” key and pressing the “L” or “A” key served as the judgment reaction time.

During the experiment, participants sat 70 cm from the computer screen and wore headphones. Before formal testing, participants completed a practice test using four temporal words (two past and two future words not appearing in the formal experiment), with identical procedures and requirements to the formal experiment. Participants began formal testing after reporting familiarity with the experimental procedure. The computer screen first displayed instructions explaining the temporal word position types, and participants were required to make judgments about the positions of temporal words played through headphones according to the instructions. For example, when instructions stated “Press ‘L’ for future temporal words and ‘A’ for past temporal words,” participants needed to: 1) press the “G” key to play the audio; 2) listen carefully to the temporal word; 3) make the corresponding keypress response based on the heard temporal word. When instructions stated the opposite mapping, the response pattern was reversed. After participants made their keypress judgment, the next trial began. If participants did not respond within 2000 ms, the program automatically advanced to the next trial. The computer automatically recorded participants’ judgment reaction times and accuracy rates.

4.5 Results and Analysis

Error rates were low and evenly distributed (below 5%), so no statistical analysis was conducted. For reaction time analysis, trials with no response, incorrect responses, and reaction times beyond $M \pm 2.5 SD$ were removed, accounting for 4.3% of all data. The results are presented in Table 3 .

Repeated measures ANOVA on reaction times revealed a significant main effect of response type, $F(1, 76) = 34.68, p < 0.001, \eta^2_p = 0.31$; $F(1, 58) = 29.44, p < 0.001, \eta^2_p = 0.34$. The main effect of participant type was not significant, $F(1, 76) < 1, p > 0.05, F(1, 58) < 1, p > 0.05$. The interaction between response type and participant type was significant, $F(1, 76) = 31.21, p < 0.001, \eta^2_p = 0.29$; $F(1, 58) = 36.97, p < 0.001, \eta^2_p = 0.39$. Simple effects analysis showed that for Qiang participants, reaction times in the congruent condition were faster than in the incongruent condition, $p < 0.001$. For Han participants, there was no difference in reaction times between incongruent and congruent conditions, $p = 0.879$.

Experiment 3 demonstrated that when the spatial relationship implied by temporal words was congruent with the keypress position, participants responded faster; when incongruent, they responded slower, indicating a “metaphoric congruency effect” between space-time mapping relationships and keypress spatial positions. Specifically, Qiang people primarily exhibit a “past-in-front, future-in-back” implicit space-time mapping. In contrast, Han people show no preference for either “past-in-front/future-in-back” or “future-in-front/past-in-back” implicit space-time mappings, resulting in no significant difference in reaction times between the two conditions. These findings further corroborate the results of Experiment 1. Combined with the temporal focus tendencies of Han and Qiang participants in Experiment 2, the results demonstrate that attention to past and future times can indeed predict the directionality of their implicit space-time mappings, providing supporting evidence for the Temporal Focus Hypothesis.

5. General Discussion

5.1 Preference Selection for Implicit Space-Time Mappings in Han and Qiang Chinese

Concepts emerge from people’s interactions with the world, yet concepts can be concrete or abstract, and their representation modes differ accordingly (Paivio, 1971, 1990; Binder, Westbury, McKiernan, Possing, & Medler, 2005). Conceptual Metaphor Theory posits that metaphor is the way people construe the world—an essential and habitual method for conceptualizing our world. The essence of metaphor is using a simple, concrete, and accessible cognitive domain to understand another complex, abstract, and inaccessible domain. For instance, abstract concepts such as time are primarily represented through concrete concepts via metaphor (Lakoff & Johnson, 2003). Space is the fundamental arena of human production and life, where subjects can obtain direct experience through bodily contact with space, making it central to human conceptual systems. In contrast, since humans cannot directly represent time through bodily experience, they habitually use spatial experience as a foundation, employing metaphorical cognition to project knowledge from the spatial domain onto the temporal domain, thereby accomplishing temporal concept representation and forming various space-time mappings.

Experiment 1 used a time diagram task to examine the directionality of implicit space-time mappings in Han and Qiang Chinese. In Qiang people’s temporal concept representation, a “past-in-front, future-in-back” implicit space-time mapping exists, whereas Han people’s temporal concept representation shows no clear preference between “past-in-front/future-in-back” and “future-in-front/past-in-back” mappings. However, since both Han and Qiang participants used Mandarin Chinese yet exhibited different implicit space-time mappings, this suggests that language is not the determining factor for their implicit temporal cognition,

which does not support the Metaphor Structure View. The Temporal Focus Hypothesis posits that the degree of attention to past and future times can predict people's implicit space-time mapping direction. Although previous ethnological research has found that Qiang people's "respecting elders" concept is deeply rooted and may exhibit "past-oriented" psychological tendencies (Xu, 2006), inferring that Qiang people have stronger past-oriented temporal thinking than Han people based solely on cultural customs may not be entirely reliable. To examine Han and Qiang people's preferences for past and future temporal focus, Experiment 2 was designed.

5.2 Can Language Influence Temporal Cognition in Han and Qiang Chinese?

The results of Experiments 1 and 3 showed that Han people showed no preference between "past-in-front" and "future-in-front" metaphorical mappings. This aligns both with Han people's equal attention to past and future and with Mandarin's simultaneous encoding of both "past-in-front" and "future-in-front" expressions, thereby supporting both the Metaphor Structure View and Temporal Focus Hypothesis. However, it should be noted that people's implicit space-time mappings exhibit considerable flexibility and plasticity. Even within groups living in the same culture and using the same language, implicit space-time mappings may differ. This suggests that language may not be the sole determinant of people's temporal cognition. For example, de la Fuente et al. (2014) found that compared to young Spaniards, older Spaniards preferred to use "past-in-front" implicit space-time mappings. This may be because increased age can trigger heightened nostalgia, leading to greater attention to past events. Li and Cao (2018) also found that compared to non-pregnant Han women, pregnant Han women tended to use "future-in-front" mappings. This is because pregnancy and the transition to motherhood can trigger deep reflection and replanning regarding future life and events, such as balancing work and family and focusing on children's healthy development, thereby leading individuals to exhibit higher attention to the future (Li, Peng, & Xiong, 2015). These findings suggest that besides language, other factors may influence temporal cognition, such as cultural attitudes and individual differences related to temporal focus.

The experimental results also revealed that Qiang people tend to use "past-in-front, future-in-back" mappings, and this mapping relationship facilitates their temporal concept processing, producing a space-time metaphor congruency effect. Previous research has indicated that the "past-in-front, future-in-back" mapping existing in some cultural groups' mental cognition primarily originates from visual markers in language. For example, Núñez and Sweetser (2006) found that Aymara speakers not only habitually use "past-in-front, future-in-back" mappings in spoken language but also tend to place the past in front and the future in back in their implicit cognition (e.g., co-speech gestures). The researchers argued that this is mainly because Aymara must use grammatical markers of evidentiality when expressing information/knowledge sources, indi-

cating whether something was personally witnessed, making vision particularly important for speakers. Based on general experience, the past is time that has been experienced and has high visibility, so Aymara people tend to place it in front of the body (eyes). However, the future is invisible, intangible, and difficult to predict, so Aymara people tend to place it behind the body (eyes), indicating low visibility. Sullivan and Bui (2016) found similar “past-in-front, future-in-back” mappings in Vietnamese. The researchers noted that although Vietnamese lacks evidentiality markers like Aymara, its linguistic deictic system contains visual markers used to indicate object visibility. For example, Vietnamese has two distal demonstratives, *nɔ* and *kia*, both meaning “that,” but the former primarily refers to invisible objects while the latter indicates visible referents, and their usage cannot be confused. Thus, visual markers in grammar are important factors influencing temporal cognition in Aymara and Vietnamese. However, the Qiang participants in this study primarily used Mandarin Chinese in daily communication, and Mandarin’s grammatical system lacks visual markers similar to those in Aymara and Vietnamese. Moreover, while Mandarin simultaneously encodes both “past-in-front” and “future-in-front” metaphorical mappings, Qiang people using Mandarin showed a strong preference for “past-in-front” mappings. This suggests that language may not be the sole factor determining Qiang people’s use of “past-in-front, future-in-back” mappings. Instead, Qiang people’s attention to past and future times can effectively predict their implicit space-time mapping direction, providing supporting evidence for the Temporal Focus Hypothesis.

Integrating the current experimental results with previous research reveals that temporal cognition systems exhibit considerable flexibility and variability, with numerous factors including language and culture influencing people’s temporal focus, thereby altering the directionality of implicit space-time metaphorical mappings. On one hand, language shapes people’s mental temporal representations. Space-time metaphorical expressions contained in language influence people’s temporal cognition and psychological characteristics, leading to cross-cultural differences in temporal thinking patterns. On the other hand, although people’s use of temporal language remains relatively stable, the directionality of their implicit space-time mappings may change with individual and environmental variations. This indicates that temporal focus possesses strong flexibility, allowing people to allocate attention appropriately to past, present, and future events according to their needs. From an evolutionary perspective, the match between temporal focus and external environmental demands is crucial for human survival (Gibson, Waller, Carpenter, & Conte, 2007; Huy, 2001), which consequently leads to changes in the directionality of people’s implicit space-time mappings. For the complex human temporal cognition system, the Metaphor Structure View and Temporal Focus Hypothesis may each have explanatory power, and only by combining them can we provide a more comprehensive and reasonable explanation of the cognitive mechanisms underlying temporal thinking patterns.

5.3 Differences in Temporal Focus Between Han and Qiang Cultures

Previous research has found that influenced by Confucian thought, Chinese people exhibit relatively strong “past-oriented thinking.” For example, Ji et al. (2009) compared Chinese and Canadian participants and found that the former had better memory for past information than the latter, possibly because they paid more attention to past times. However, it should be noted that this conclusion was primarily based on comparisons between Chinese and Western participants, without considering possible ethnic differences within Chinese culture. Experiment 2 used the Temporal Focus Scale to examine Han and Qiang participants’ emphasis on past and future times. The results showed that Qiang people valued past times more than Han participants, whereas Han participants showed no clear preference for past or future times. This finding is largely consistent with existing ethnological research. The Qiang tradition of “respecting elders” rather than “cherishing the young” easily creates a “past-oriented” psychological temporal orientation. This psychological temporal orientation is still manifested in all aspects of Qiang people’ s lives today. For example, Qiang funeral shamanic classics contain rich ultimate care consciousness. Through mourning the deceased, they express gratitude, careful final repayment, and ancestor-returning concepts, embodying endless gratitude and strong filial piety concepts (Dong & Wang, 2012).

In contrast, Han people’ s lack of higher attention to past times may be related to their cultural custom of both “respecting elders” and “cherishing the young.” Meanwhile, Han people’ s practice of “respecting elders” and “filial piety” concepts may be weaker than that of Qiang people. For example, modern Han people emphasize “serving the living” over “serving the dead,” focusing on emotional relationships with parents during their lifetime while downplaying funeral and memorial issues after their death. This differs from Qiang people’ s filial piety concept that considers “serving the living” and “serving the dead” equally important. Chen (2016) found that with rapid socio-economic development, filial piety among contemporary Han university students has declined, with various problems emerging. Fan, Wang, Huang, Shi, and Xia (2009) also found that as an important dimension of “filial piety,” the concept of continuing family lineage has weakened due to changes in family structure and function and the influence of the one-child policy. For example, the vast majority of Han participants in this study were only children, whereas most Qiang participants were from multi-child families. Therefore, factors such as modern lifestyle, cultural design, and national policy may all dilute Han people’ s traditional filial piety concepts and weaken their “past-oriented thinking.”

5.4 Conclusions

This study investigated the implicit space-time mappings and temporal focus of Han and Qiang Chinese through three experiments. The main conclusions are as follows:

1. Qiang people primarily use a “past-in-front” implicit space-time mapping, whereas Han people show no clear preference between “past-in-front” and “future-in-front” metaphorical mapping relations.
2. Implicit space-time mappings influence the online processing of temporal concepts in both Han and Qiang participants, producing a “metaphoric congruency effect.”
3. The directionality of implicit space-time mapping connections in Han and Qiang Chinese is primarily influenced by their attention to past and future times, consistent with the predictions of the Temporal Focus Hypothesis.

References

- Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences*, 22, 577–660.
- Barsalou, L. W. (2016). On staying grounded and avoiding Quixotic dead ends. *Psychonomic Bulletin & Review*, 23(4), 1122–1142.
- Binder, J. R., Westbury, C. F., McKiernan, K. A., Possing, E. T., & Medler, D. A. (2005). Distinct brain systems for processing concrete and abstract concepts. *Journal of Cognitive Neuroscience*, 17(6), 905–917.
- Boroditsky, L. (2000). Metaphoric structuring: Understanding time through spatial metaphors. *Cognition*, 75(1), 1–28.
- Boroditsky, L. (2001). Does language shape thought?: Mandarin and English speakers’ conceptions of time. *Cognitive Psychology*, 43(1), 1–22.
- Casasanto, D. (2016). Temporal language and temporal thinking may not go hand in hand. In B. Lewandowska-Tomaszczyk (Ed.), *Conceptualizations of time* (pp. 169–186). Amsterdam: John Benjamins.
- Casasanto, D. (2017). Relationships between language and cognition. In B. Dancygier (Ed.), *Cambridge handbook of cognitive linguistics* (pp. 19–37). Cambridge: Cambridge University Press.
- Casasanto, D., & Jasmin, K. (2012). The hands of time: Temporal gestures in English speakers. *Cognitive Linguistics*, 23(4), 643–674.
- Chen, J. J. (2016). *The present situation of filial piety and its education in contemporary college students* (Unpublished master’s thesis). Hebei University of Science & Technology, Shijiazhuang. [陈娇娇. (2016). 当代大学生孝道现状及其教育研究 (硕士学位论文). 河北科技大学, 石家庄.]
- Chen, S. Y. (2015). *Qiang culture*. Chengdu: Southwest Jiaotong University Press. [陈蜀玉. (2015). 羌族文化. 成都: 西南交通大学出版社.]

- de La Fuente, J., Santiago, J., Román, A., Dumitrache, C., & Casasanto, D. (2014). When you think about it, your past is in front of you: How culture shapes spatial conceptions of time. *Psychological Science*, 25(9), 1682–1690.
- Dong, C. B., & Wang, L. M. (2012). A discussion on standards of filial piety in Qiang' s funeral. *Collected Papers of Local Cultural Research*, 5, 165–170. [董常保, 王利明. (2012). 羌族丧葬释比中的孝道观略论. 地方文化研究辑刊, 5, 165–170.]
- Fan, F. H., Wang, H., Huang, X. T., Shi, H. Y., & Xia, L. X. (2009). The cognitive structure of filial piety in Contemporary Chinese. *Psychological Science Sinica*, 32(3), 751–754. [范丰慧, 汪宏, 黄希庭, 史慧颖, 夏凌翔. (2009). 当代中国人的孝道认知结构. 心理科学, 32(3), 751–754.]
- Fuhrman, O., McCormick, K., Chen, E., Jiang, H., Shu, D. F., Mao, S., & Boroditsky, L. (2011). How linguistic and cultural forces shape conceptions of time: English and mandarin time in 3D. *Cognitive Science*, 35(7), 1305–1328.
- Gibson, C. B., Waller, M. J., Carpenter, M. A., & Conte, J. M. (2007). Antecedents, consequences, and moderators of time perspective heterogeneity for knowledge management in MNO teams. *Journal of Organizational Behavior*, 28(8), 1005–1034.
- Gijssels, T. & Casasanto, D. (2017). Conceptualizing time in terms of space: Experimental evidence. In B. Dancygier (Ed.), *Cambridge handbook of cognitive linguistics* (pp. 651–668). Cambridge: Cambridge University Press.
- Gu, Y., Zheng, Y. Q., & Swerts, M. (2016). Which is in front of Chinese people: Past or Future?: A study on Chinese people' s space-time mapping. In A. Papafragou, D. Grodner, D. Mirman, & J. C. Trueswell (Eds.), *Proceedings of the 38th annual conference of the cognitive science society* (pp. 2603–2608). Austin, TX: Cognitive Science Society.
- Han, Y. J. (2014). *The heritage and education of Qiang culture*. Beijing: The Ethical Publishing House. [韩云洁. (2014). 羌族文化传承与教育. 北京: 民族出版社.]
- Hendricks, R. K., & Boroditsky, L. (2017). New space–time metaphors foster new nonlinguistic representations. *Topics in Cognitive Science*, 9(3), 800–818.
- Huy, Q. N. (2001). Time, temporal capability, and planned change. *Academy of Management Review*, 26(4), 601–623.
- Ji, L. J., Guo, T. Y., Zhang, Z. Y., & Messervey, D. (2009). Looking into the past: Cultural differences in perception and representation of past information. *Journal of Personality and Social Psychology*, 96(4), 761–769.
- Kövecses, Z. (2015). *Where metaphors come from: Reconsidering context in metaphor*. Oxford, UK: Oxford University Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*. New York: Basic Books.

- Lakoff, G., & Johnson, M. (2003). *Metaphors we live by*. Chicago: University of Chicago Press.
- Landau, M. J., Robinson, M. D., & Meier, B. P. (Eds.). (2013). *The power of metaphor: Examining its influence on social life*. Washington, DC: American Psychological Association.
- Li, A. M., Peng, Y., & Xiong, G. X. (2015). Are pregnant women more fore-sighted? The effect of pregnancy on intertemporal choice. *Psychological Science Sinica*, 47(11), 1360–1370. [李爱梅, 彭元, 熊冠星. (2015). 孕妇更长计远虑?——怀孕对女性跨期决策偏好的影响. *心理学报*, 47(11), 1360–1370.]
- Li, H. (2016). The psychological reality of spatial metaphors for time—Evidence from gesture and sign language. *Psychological Science Sinica*, 39(5), 1080–1085. [李恒. (2016). 时空隐喻的心理现实性: 手势和手语的视角. *心理科学*, 39(5), 1080–1085.]
- Li, H. (2017). Time on hands: Deliberate and spontaneous temporal gestures by speakers of Mandarin. *Gesture*, 16(3), 396–415.
- Li, H., & Cao, Y. (2017). Personal attitudes toward time: The relationship between temporal focus, space-time mappings and real life experiences. *Scandinavian Journal of Psychology*, 58(3), 193–198.
- Li, H., & Cao, Y. (2018). The hope of the future: The experience of pregnancy influences women's implicit space-time mappings. *The Journal of Social Psychology*, 158(2): 152–156.
- Li, H., Wu, L., & Wugen, Z. G. (2013). A cognitive study of metaphor and metonymy of time in Tibetan Gesture Language. *Journal of the Minzu University of China (Philosophy and Social Sciences Edition)*, 40(6), 160–165. [李恒, 吴铃, 吾根卓嘎. (2013). 西藏手语时间隐喻和转喻的认知研究. *中央民族大学学报 (哲学社会科学版)*, 40(6), 160–165.]
- Li, H. J., Zhang, J. J., & Zhang, R. X. (2014). The vertically spatial metaphors of kinship words of Qiang nationality. *Acta Psychologica Sinica*, 46(4), 481–491. [李惠娟, 张积家, 张瑞芯. (2014). 上下意象图式对羌族亲属词认知的影响. *心理学报*, 46(4), 481–491.]
- Liu, X. Y., & Zhang Z. J. (2016). The modulation of temporal focus on the effect of spatial-temporal association of response codes. *Psychological Science Sinica*, 39(2), 279–284. [刘馨元, 张志杰. (2016). 不同时间关注点下的空间-时间联合编码效应. *心理科学*, 39(2), 279–284.]
- Moore, K. E. (2014). *The spatial language of time*. Amsterdam: John Benjamins press.
- Núñez, R. E., & Sweetser, E. (2006). With the future behind them: Convergent evidence from Aymara language and gesture in the crosslinguistic comparison of spatial construals of time. *Cognitive Science*, 30(3), 401–450.
- Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart & Winston.

Paivio, A. (1990). *Mental representations: A dual-coding approach*. New York: Oxford University Press.

Rinaldi, L., Vecchi, T., Fantino, M., Merabet, L. B., & Cattaneo, Z. (2018). The ego-moving metaphor of time relies on visual experience: No representation of time along the sagittal space in the blind. *Journal of Experimental Psychology: General*, 147(3), 444–450.

Shipp, A. J., Edwards, J. R., & Lambert, L. S. (2009). Conceptualization and measurement of temporal focus: The subjective experience of the past, present, and future. *Organizational Behavior and Human Decision Processes*, 110(1), 1–22.

Song, Y. Q., & Zhang, J. J. (2016-6-15). Ethnic differences in time metaphor cognition. *Chinese Social Science Newspaper*, 006. [宋宜琪, 张积家. (2016-6-15). 时间隐喻认知具有民族差异性. 中国社会科学报, 006.]

Sullivan, K., & Bui, L. T. (2016). With the future coming up behind them: Evidence that Time approaches from behind in Vietnamese. *Cognitive linguistics*, 27(2), 205–233.

Walker, E., & Cooperrider, K. (2016). The continuity of metaphor: Evidence from temporal gestures. *Cognitive Science*, 40(2), 481–495.

Xu, P. (2006). *Cultural adaptation and change: Sichuan Qiang survey*. Shanghai: Shanghai People's Publishing House. [徐平. (2006). 文化的适应和变迁: 四川羌村调查. 上海: 上海人民出版社.]

Ye, H. S. (2011). Embodied cognition: A consideration from theoretical psychology. *Acta Psychologica Sinica*, 43(5), 589–598. [叶浩生. (2011). 有关具身认知思潮的理论心理学思考. 心理学报, 43(5), 589–598.]

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv – Machine translation. Verify with original.