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Research article

Finding the vanished self: Perspective modulates neural substrates of self-reflection in Buddhists

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ABSTRACT

Asians' self-views are flexible and influenced by short-term situational and long-term cultural factors. Due to the long-term religious cultural influence of Chinese Buddhism, Buddhists showed no self-advantage in behavioral and neural level in many previous studies. However, it is unclear whether Chinese Buddhists really have no self-awareness or self-concept. The beliefs of illusionary self and thinking of others first might suggest that the self of Buddhists comes from others' perspective. The present study examined the self of Buddhists in first- and third-person perspective through the self-referential processing paradigm, comparing the behavioral and neural difference when they make self-, friend- and famous-judgment. The behavioral data showed that there were no di□erent recognition ratios between self-, friend-, and famous-processing for participants in first- and third-person perspective. However, the neural results showed that people in third-person perspective group showed significant di□erence between self- and famous-processing in ventral medial prefrontal cortex, whereas people in first-person perspective group did not show any significant di□erence in activation between self-, friend-, and famous-processing in these regions. These findings suggested that Buddhists have self-referential processing only in third-person perspective, not in first-person perspective. This study provides neuroimaging evidence for the influence of perspective on Buddhists' self-reflection, and provide empirical evidence supporting and extending culture as situated cognition model of Asia by considering perspective factor.

1. Introduction

Humans' perceptions of the self can be based on their reflections on their own behaviors or on others' perceptions [1,2]. Meanwhile, numerous cross-cultural studies have found that there were di□erences between Westerners and Easterners when reflecting on themselves [3–6]. European Americans tend to view the self as an autonomous entity that is separated from others and take a first-person perspective (1PP) to understand themselves. In comparison, East Asians tend to view the self as a socially embedded entity with strong interconnectedness with others and take a third-person perspective (3PP) to reflect themselves [7–9]. These cultural di□erences, nonetheless, do not mean that East Asians are simply sharing themselves with others or passive recipients of others' judgments of the self. Previous studies have found that East Asians' self-concepts are contextual or cultural dependent. According to the views of "culture as situated cognition model", Asians' self-views are not fixed, but fluid and flexible [10,11]. More specifically, these dynamic self-views could be influenced by short-term situational factors and long-term cultural factors.

Previous studies on self-reflection have temporarily manipulated the situations or contexts, which requires participants to assess themselves in a specific perspective or cultural priming condition [12–14]. Research showed that East Asian participants can use 1PP or 3PP to think of themselves [13]. The self-processing in 3PP might be consistent with the collectivistic cultural context [12]. More importantly, they provided further evidence for the influence of short-term situation on Asians' flexible self-views [14]. This study adopted a western or eastern contextual priming and their participants were asked to complete a self-reflection task. The neural activity pattern showed that participants primed by individualistic context showed increased activation within medial prefrontal cortex (mPFC) and posterior cingulate cortex (PCC) during general self-reflection relative to contextual self-reflection,

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whereas participants primed by collectivistic context showed increased activation within mPFC and PCC during contextual self-reflection relative to general self-reflection. These findings indicated that the neural correlates of self could be dynamically modulated by contextual priming, which activated di□erent cultural self-reflection styles. It suggested a strong powerful basis of short-term situations. Neuroimaging studies also found that the activity of the brain region related to self-referential processing is influenced by long-term religious cultural factors [15]. Although the situation or context can temporarily modulate self-reflection pattern, the individuals shaped by religious belief of Buddhism can show a typical Asian pattern acquiescently [16,17]. In Han and his colleague's study, Chinese Buddhists did not activate the ventral medial prefrontal cortex (vmPFC) in self-judgment condition relative to other conditions when they took 1PP to complete self-referential processing [16]. This suggested that Buddhist participants failed to generate increased self-advantage e□ect. These results could be explained by the Buddhist doctrine of No-self. As a typical Asian religion——Buddhism advocates that people should put down obsessiveness about self and follow the power of the external world [18–20].

Despite these findings, it remains unclear whether the behavioral and neural activity patterns really mean that Chinese Buddhists have no self-awareness or self-concept. Lutz [21] emphasized "although self-awareness is universal, cultures di□er in how the self is conceptualized and experienced". However, all the previous studies required participants to use 1PP when they completed the self-referential memory task [16,17]. According to the findings and the model we mentioned previously, although previous studies failed to find self-related advantage or neural activity in Buddhists, there is also an alternative explanation——Buddhists, shaped by long-term religious cultural environment of Asia, have a special thinking style when they reflect the self. On one hand, Buddhism makes unique claims about nature of the self [19,20], wherein the self, as experienced in the physical world, is illusionary and artificial. On the other hand, Buddhism also claims that individual should think of others first [20,22], that is to say Buddhists should always put the interest of others above their own. Based on these views, we suspect that Buddhists may have a typical eastern self-view, that is toning down the self and taking another person's perspective to consider the world or even themselves. However, to date, we know very little about the behavioral patterns or neural substrates of self-referential processing in Buddhists under 3PP condition.

Previous studies have found that the non-Buddhist's self-reflection pattern is clear and stable [3,21,23], and Buddhist have a di□erent pattern in 1PP condition [16,17]. Based on these findings the current study mainly focused on the self-reflection of Buddhist, and found the influence of perspective (i.e., 1PP vs. 3PP) on Buddhists' self-processing.

The purpose of the current study is to investigate the behavioral and neural activity di□erences between 1PP and 3PP when Buddhists considered themselves. To address the unexplored problem, the current study adopted an established self-referential memory task previously used during functional magnetic resonance imaging (fMRI) with Chinese Buddhists [16,17]. To examine the e□ect of perspective on the self-processing of Buddhists, we manipulated the perspective in the self-referential memory processing paradigm. Participants were asked to make adjective judgments under 1PP or 3PP separately. Based on prior work and theory, we hypothesized that Buddhists with di□erent types of perspective should engage in di□erent behavioral and neural activity patterns when reflecting the self: Buddhists would exhibit reduced self-reference e□ect or regional activation under 1PP condition. However, under 3PP condition, they would exhibit significant increased self-reference e□ect or regional activation in brain regions associated with self-referential processing, including mPFC and ACC [3,17,24]. We used a region-of-interest (ROI) based analytical approach to focus on activity in these specific areas to test this hypothesis.

2. Materials and methods

2.1. Participants

40 college students participated this experiment. All participants were born and lived in a district with Buddhism belief, and also were self-identified Buddhists. All were right-handed and had normal or corrected-to-normal vision. None of them had a history of neurological or psychiatric disorders. Informed consent were acquired prior to the experiment in accordance with Peking University's Psychology Ethics Committee. Participants were paid for their participation. Half of them were assigned to the 1PP condition (10 females and 10 males, 19.6 ± 1.0 years old), the other half were assigned to the 3PP condition (10 females and 10 males, 19.5 ± 1.2 years old).

2.2. Materials and procedures

Stimuli were selected from those used in our previous study [17]. A total of 384 adjectives were divided into 32 lists of 12 words which were presented in each session. Half of the words were positive adjectives and half were negative adjectives. Sixteen lists of words were pseudo randomly selected for the judgment tasks, while the remaining

resolution: 1024 × 768) onto a translucent screen placed inside the scanner bore. Participants viewed the stimuli through a mirror mounted on the head coil. The viewing distance was 90 cm. Blood oxygen level-dependent (BOLD) signals were acquired with an echo-planar imaging sequence (TR = 2000 ms, TE = 30 ms, FOV = 240 mm, flip angle = 90°, slice thickness = 3.5 mm, number of slices = 32, 64 × 64 matrix with 3.1 × 3.1 × 3.5 mm spatial resolution). A high-resolution structural image was acquired using a standard 3D T1-weighted sequence with 1.0 × 1.0 mm in plane resolution and 1 mm slice thickness (256 × 256 matrix, 1.0 × 1.0 × 1.0 mm spatial resolution, TR = 2600 ms, TE = 3.02 ms).

2.4. Data analyses

Behavioral data. Response time for judgments made in the trait judgment stage was analyzed using a 2 (group) × 4 (condition) repeated measures analysis of variance. Accuracy of font-judgment was compared between two groups. Post-hoc comparisons were performed with Bonferroni correction.

In the recognition stage, hit rate was analyzed using a 2 (group) × 4 (condition) repeated measures analysis of variance, also hit rate was analyzed for "remember" and "know" condition separately.

fMRI data. Statistical Parametric Mapping software (SPM8, Wellcome Department of Cognitive Neurology, UK) was used for imaging data processing and analysis. Functional images were realigned to correct for head movement between scans and co-registered with each participant's anatomical scan. Functional images were transformed into a standard anatomical space (3 × 3 × 3 mm^3 voxel size) based on the Montreal Neurological Institute (MNI) template. Normalized data were then spatially smoothed with an 8-mm full-width at half-maximum Gaussian kernel. Two participants were removed from data analysis for the head movement above 3.0, this left 19 participants for each group.

On the individual level, a general linear model was used to compute parameter estimates and t-contrast images for each comparison at each voxel. The contrasts of self-, friend- and other-processing were defined in each participant. These individual contrast images were then submitted to a second-level random-e□ect analysis. A Monte Carlo stimulation using the AlphaSim program (http://afni.nimh.nih.gov/pub/dist/doc/manual/AlphaSim.pdf) was conducted to determine an appropriate cluster threshold. Assuming an individual voxel type I error of $p < 0.005$, a cluster extent of 39 continuous voxels was indicated as necessary to correct for multiple voxel comparisons at $p < 0.05$. The SPM coordinates were converted from MNI template to Talairach coordinates [29] using a non-linear transform method.

To confirm the results of GLM analysis, we performed region of interest (ROI) analysis. The ROI regions were defined using previous defined ROIs, with a radius of 3 mm and centered at coordinates 0/40/18 for mPFC and -6/36/20 for ACC [3,30]. The BOLD signal of voxels in the ROIs were calculated and subjected to an ANOVA analysis.

3. Results

3.1. Behavioral data

Trait judgment stage. Data can be found in Table 1 and Fig. 1. A two-way repeated measure ANOVA of reaction time analysis showed that there was a significant main e□ect of condition, $F(3, 114) = 19.568$, $p < 0.001$, famous-judgment was faster than self-judgment ($p < 0.01$), and was marginally and significantly faster than friend-judgment ($p = 0.054$), font-judgment was faster than self- ($p < 0.001$), friend- ($p < 0.001$) and famous-judgment ($p < 0.05$), and there was also a significant interaction e□ect of condition and group, $F(3, 114) = 4.557$, $p < 0.01$, but no main e□ect of group was found. Simple e□ect analysis showed that there was a significant main e□ect of condition for 1PP ($F(3,114) = 6.06$, $p < 0.001$) and 3PP ($F(3,114) = 18.06$, $p < 0.001$) group. Post-hoc comparison showed that famous-judgment of 3PP was marginally and significantly faster than that of 1PP ($p = 0.053$). For 1PP group, font-judgment was faster than self-judgment ($p < 0.01$) and famous-judgment ($p < 0.05$). For 3PP group, famous-judgment was faster than self- and friend-judgment, $p < 0.001$, also font-judgment was faster than self- and friend-judgment, $p < 0.001$. These results indicated that font-judgment was relatively easier than three trait judgments, and 3PP was better than 1PP to some extent, with faster reaction time in the famous condition.

Table 1
Behavioral data in the trait judgment stage. Including mean reaction time and SD of self-, friend-, famous-, and font-judgment, and the accuracy of font-judgment. SD = Standard deviation.

	1PP		3PP	
	Mean (ms)	SD	Mean (ms)	SD
self	428.0	13.7	428.8	13.8
friend	420.2	15.0	418.2	15.0
famous	426.1	15.0	383.5	15.0
font	392.1	14.8	367.7	14.8
font accuracy (%)	0.69	0.03	0.63	0.04

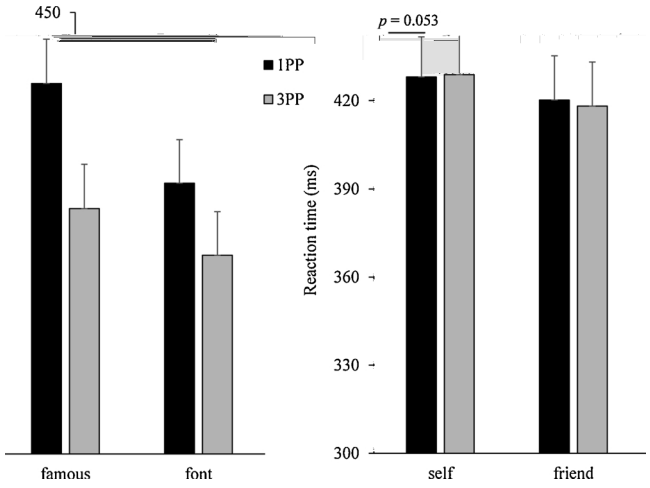

Fig. 1. Results of Reaction time on self-, friend, famous, and font-judgment in first- and third-person perspective in the trait judgment stage.

Accuracy of font-judgment showed that there was no di□erence between 1PP (0.69) and 3PP (0.63), $t = 1.250$, $p = 0.219$. The environmental setting in the fMRI room (e.g., the distance between the eyes of the subjects and the stimuli was 90 cm, the light of the room was dim) might influence the visual recognition of the stimuli, increasing the di□culty of font judgment which was related with the visual information of stimuli. Therefore we ran the item analysis. Results showed that accuracy of 44 items (11.5% of all items) were lower than 0.5. After deleting these items, the accuracy of 1PP and 3PP were 0.74 and 0.67, and *t*-test showed that there was no di□erence between the two groups ($t = 1.431$, $p = 0.161$).

Recognition stage. Mean hit rate and SD of retrieval stage are in Table 2. Repeated measure ANOVA of total hit rate showed a significant condition main e□ect, $F(3, 114) = 53.449$, $p < 0.001$, self-, friend- and famous-judgment was higher than font-judgment, $ps < 0.001$, there were no significant group main e□ect or interaction e□ect.

Also, hit rate of "remember" and "knowing" judgment was analyzed separately, and the results of "remember" judgment was similar with the result of total hit rate, showed a significant condition main e□ect, $F(3, 114) = 36.962$, $p < 0.001$, self-, friend- and famous-judgment was higher than font-judgment, $ps < 0.001$, there were no significant group main e□ect or interaction e□ect. However, results of hit rate of "know" judgment showed no significant main e□ect or interaction e□ect.

Table 2
Mean hit rate and SD of retrieval stage. There are total hit rate (total), recognition hit rate (remember), and know hit rate (know) for self-, friend, famous- and font-judgment. SD = Standard deviation.

	1PP			3PP		
	total	remember	know	total	remember	know
self	0.65(0.03)	0.42(0.05)	0.23(0.05)	0.58(0.03)	0.36(0.04)	0.22(0.04)
friend	0.64(0.04)	0.40(0.05)	0.24(0.05)	0.59(0.04)	0.37(0.04)	0.22(0.04)
famous	0.64(0.04)	0.37(0.05)	0.27(0.05)	0.56(0.04)	0.35(0.04)	0.21(0.04)
font	0.46(0.04)	0.23(0.03)	0.22(0.03)	0.40(0.04)	0.22(0.04)	0.17(0.04)

Table 3
Regions activated in comparison of self- vs friend-, self- vs famous-, and self- vs font-judgment in first- and third-person perspective group in while brain analysis. Also, the Braodmann's area, Talairach coordinates, Z scores of activated clusters and cluster size are shown.

Condition/Regions	BA	MNI				Voxel no.
		x	y	z	Z	
1PP						
vs friend						
no significant activation area vs famous						
no significant activation area vs font						
Superior medial frontal gyrus	8	−6	38	55	10.14	
682 Supplementary motor area	6	6	64	6.96		
6 Superior Frontal Gyrus	47	−8	40	9	6.27	Posterior cingulat

Results of total hit rate and "remember" hit rate suggested that three trait-judgments might be processed more specific than font-judgment, leading to better memory performance.

3.2. Image data

Whole brain analysis. Brain activation data are shown in Table 3 and Fig. 2.

For 1PP participants, the comparison of three trait-judgment condition showed no significant activation. However, the comparison of self- vs font-judgment activated left superior frontal gyrus, left middle frontal gyrus and so on, which were related with language processing. For 3PP participants, self- vs font-judgment also activated language related regions, such as left inferior frontal gyrus, left superior frontal gyrus and so on. Compared to friend-judgment, self-judgment activated right medial prefrontal cortex, left and right anterior cingulate cortex. Compared to famous-judgment, self-judgment activated right medial prefrontal gyrus, left anterior cingulate cortex, left inferior frontal gyrus, left parahippocampal gyrus, left and right thalamus. We used the mPFC region activated in the self- vs famous-judgment in 3PP participants as mask and extracted the beta values of self-, friend-, and famous-judgment, the ANOVA analysis showed that the main e□ect was significant, $F(2, 36) = 7.592$, $p < 0.01$, post-hoc comparison showed that self-judgment was activated higher than friend- ($p < 0.05$) and famous-judgment ($p < 0.05$). The mPFC region were considered to be related with self processing [3,31,32]. These results might suggest that the self processing would only appear in 3PP for participants.

ROI analysis. ROI analysis of 3PP participants were conducted to further confirm the self processing e□ect. The mPFC and ACC regions were centered at 0/40/18 for mPFC, and -6/36/20 for ACC [3,30], and the sphere was 3 mm. For mPFC, there was a significant condition main e□ect, $F(2, 36) = 4.694$, $p < 0.05$, post-hoc comparison showed that fMRI signal of self-judgment was significantly larger than that of friend-judgment, $p < 0.05$. For ACC, there was a significant condition main e□ect, $F(2, 36) = 4.747$, $p < 0.05$, post-hoc comparison showed that fMRI signal of self-judgment was significantly larger than that of friend-judgment, $p < 0.05$ (Fig. 3).

4. Discussion

The current study explored potential influence of perspective on behavioral and neural substrates of Buddhist's self-referential processing. To meet this objective, we assigned participants to perform self-referential processing task in 1PP or 3PP group, with self-reference e□ect and self-related neural activity indicating the extent of self-awareness during the self-reflection. The behavioral data partly replicated results from our previous study among Buddhist participants [17], which showed that there were no di□erent recognition ratios between self-, friend-, and famous-processing for Buddhist participants in 1PP group. In addition, we also observed that there were no di□erent recognition ratios between each type of processing in 3PP group. These behavioral results are partly consistent with our hypothesis that Buddhists should exhibit reduced self-reference e□ect in 1PP group. However, we had also hypothesized that Buddhists' self-reference e□ect

would not be a□ected when they used 3PP, but the results showed otherwise. These results suggest that, from behavioral level, Buddhists exhibited a specific unusual self-processing pattern when they reflected themselves [16,17], and there were no significant di□erences between 1PP and 3PP group.

In terms of neuroimaging data, consistent with our hypothesis, participants in 1PP group failed to generate greater BOLD activity during the self-condition relative to the other condition across ROIs [3,17]. However, the activation patterns were di□erent across the groups. Specifically, 3PP group showed significant di□erence between self- and famous-processing in ventral mPFC, whereas 1PP group did not show any significant di□erence in activation between self-, friend- and famous-processing in ventral mPFC or ACC. These results are consistent with our hypothesis that Buddhists with di□erent types of perspective should have di□erent patterns of self-reflection. These results suggested that, from neural level, although Buddhists showed a No-self tendency in 1PP group, they demonstrated significant divergence in relation to 3PP, which lead to di□erences in self-related activity pattern.

Buddhism makes unique claims about the nature of the self. Previous studies have shown that the Buddhism belief exerts a powerful e□16

when they reflect the self. Although the self-related activation disappeared under 1PP, Buddhists' self-reflection existed integrallty under 3PP condition.

The most striking finding was that the pattern of the self-reflection under the 1PP condition contrasted with that under the 3PP condition, and this pattern also di□ered from the pattern observed in the previous findings [16,17]. To our knowledge, the present study is the first to examine self-reflection of Buddhists that is modulated by perspective. These results have important implications for broadening investigations of self-reflection in religious cultural environment. Most of the previous research on self-evaluation in religious cultural environment has primarily focused on identifying the behavioral performance and neural activation under 1PP condition and concluded that Buddhist people have no self [16,17], which can be regarded as a religious belief influence. The current study further investigated another typical type of perspective and suggests that whether a Buddhist participant shows his or her self-awareness in self-referential processing largely depends on how the participant adopts perspective. That is, the previous conclusion may apply merely to the participants who hold a first-person perspective. If the Buddhist participants hold a third-person perceptive, they would tend to show their self-advantage and self-related neural activations. Some researchers think that what Buddhism denies is not that "I" exist, but that "I" exist in the subjective or first-person manner in which "I" conceive of myself as existing. In contrast, according to Buddhism, "I" am an objectively existing being in the sense that all of the facts about "me" are accessible from a third-person perspective [20]. For Buddhist participants, self is not in a privileged position to know about their body or bodily states. The body and self are fully present to outside observers. For this reason, all the facts about Buddhist participants are accessible from a third-person perspective. Furthermore, on a much grander scale, the current study also used a special Asian sample to investigate the views of "culture as situated cognition model". This model suggested that Asians' self-views are not fixed, but fluid and flexible, Our results confirmed that the dynamic self-views could be influenced by perspective [10,11].

The comparison of self- vs font-judgment in 1PP and 3PP group both activated left frontal region, which were also found in previous studies [3,33], this region was similar with studies that needs semantic processing of verbal materials [34]. In our experiment, participants needed to understand the meaning of every trait adjectives and make decisions in self-judgment, however, in font-judgment participants do not need to understand the meaning of the word. Therefore, compared with font-judgment, self-judgment encouraged semantic processing of the trait

Cogn. Sci. 19 (2015) 666–676, https://doi.org/10.1016/j.tics.2015.08.010.
[13] Y. Ma, D. Bang, C. Wang, M. Allen, C. Frith, A. Roepstor□, S. Han, Sociocultural patterning of neural activity during self-reflection, Soc. Cogn. A□ect. Neurosci. 9 (2012) 73–80, https://doi.org/10.1093/scan/nss103.
[14] J.Y. Chiao, T. Harada, H. Komeda, Z. Li, Y. Mano, D. Saito, T.B. Parrish, N. Sadato, T. Iidaka, Dynamic cultural influences on neural representations of the self, J. Cogn. Neurosci.. 22 (2014) 1–11, https://doi.org/10.1162/jocn.2009.21192.
[15] S. Han, L. Mao, X. Gu, Y. Zhu, J. Ge, Y. Ma, Neural consequences of religious belief on self-referential processing, Soc. Neurosci. 3 (2008) 1–15, https://doi.org/10.1080/17470910701469681.
[16] S. Han, X. Gu, L. Mao, J. Ge, G. Wang, Y. Ma, Neural substrates of self-referential processing in Chinese Buddhists, Soc. Cogn. A□ect. Neurosci. 5 (2010) 332–339, https://doi.org/10.1093/scan/nsp027.
[17] Y. Wu, C. Wang, X. He, L. Mao, L. Zhang, Religious beliefs influence neural substrates of self-reflection in Tibetans, Soc. Cogn. A□ect. Neurosci. 5 (2010) 324–331, https://doi.org/10.1093/scan/nsq016.
[18] J. Benovsky, Buddhist philosophy and the no-self view, Philos. East West 67 (2017) 545–553, https://doi.org/10.1353/pew.2017.0039.
[19] J. Ching, Paradigms of the self in Buddhism and Christianity, Buddh.-Christ. Stud 4 (1984) 31–50, https://doi.org/10.2307/1389935.
[20] C.K. Fink, The 'scent' of a self: Buddhism and the first-person perspective, Asian Philos 22 (2012) 289–306, https://doi.org/10.1080/09552367.2012.709736.
[21] C. Lutz, Culture and consciousness: a problem in the anthropology of knowledge, in: F.S. Kessel, P.M. Cole, D.L. Johnson (Eds.), Self and Consciousness, Lawrence Erlbaum Associates, Publishers, Hillsdale, NJ, 1992, pp. 64–87.
[22] P. Pholphirul, Happiness from giving: quantitative investigation of Thai Buddhists, Appl. Res. Qual. Life 10 (2015) 703–720, https://doi.org/10.1007/s11482-014-9349-8.
[23] T. Zhang, Y. Zhu, Y. Wu, Losing oneself upon placement in another's position: the influence of perspective on self-referential processing, Conscious. Cogn. 27 (2014) 53–61, https://doi.org/10.1016/j.concog.2014.04.003.
[24] M.L. Meyer, M.D. Lieberman, Why people are always thinking about themselves: medial prefrontal cortex activity during rest primes self-referential processing, J. Cogn. Neurosci. 30 (2018) 714–721, https://doi.org/10.1162/jocn_a_01232.
[25] E. Tulving, D. Murray, Memory and consciousness, Can. Psychol. 26 (1985) 1–12, https://doi.org/10.1037/h0080017.
[26] d.B.M. Van, S.J. Cunningham, M.A. Conway, D.J. Turk, Mine to remember: the impact of ownership on recollective experience, Q. J. Exp. Psychol. 63 (2010) 1065–1071, https://doi.org/10.1080/17470211003770938.
[27] H.L. Williams, M.A. Conway, C.J. Moulin, Remembering and knowing: using another's subjective report to make inferences about memory strength and subjective experience, Conscious. Cogn. 22 (2013) 572–588, https://doi.org/10.1016/j.concog.2013.03.009.
[28] M.A. Conway, C.W. Pleydell-Pearce, The construction of autobiographical memories in the self-memory system, Psychol. Rev. 107 (2000) 261–288, https://doi.org/10.1037//0033-295x.107.2.261.
[29] J. Talairach, P. Tournoux, Co-Planar Stereotaxic Atlas of the Human Brain, Thieme, New York, 1998.
[30] G. Wang, L. Mao, Y. Ma, X. Yang, J. Cao, X. Liu, et al., Neural representations of close others in collectivistic brains, Soc. Cogn. A□ect. Neurosci. 7 (2011) 222–229, https://doi.org/10.1093/scan/nsr002.
[31] T.F. Heatherton, C.L. Wyland, C.N. Macrae, K.E. Demos, B.T. Denny, W.M. Kelley, Medial prefrontal activity di□erentiates self from close others, Soc. Cogn. A□ect. Neurosci. 1 (2006) 18–25, https://doi.org/10.1093/scan/nsl001.
[32] W.M. Kelley, C.N. Macrae, C.L. Wyland, S. Caglar, S. Inati, T.F. Heatherton, Finding the self? An event-related fMRI study, J. Cogn. Neurosci. 14 (2002) 785–794, https://doi.org/10.1162/08989290260138672.
[33] F.I. Craik, T.M. Moroz, M. Moscovitch, D.T. Stuss, G. Winocur, E. Tulving, S. Kapur, In search of the self: a positron emission tomography study, Psychol. Sci. 10 (1999) 26–34, https://doi.org/10.1111/1467-9280.00102.
[34] R.L. Buckner, W.M. Kelley, S.E. Petersen, Frontal cortex contributes to human memory formation, Nat. Neurosci. 2 (1999) 311–314, https://doi.org/10.1038/7221.
[35] A. D'Argembeau, D. Feyers, S. Majerus, F. Collette, d.L.M. Van, P. Maquet, E. Salmon, Self-reflection across time: cortical midline structures di□erentiate between present and past selves, Soc. Cogn. A□ect. Neurosci. 3 (2008) 244–252, https://doi.org/10.1093/scan/nsn020.
[36] J. Sui, S. Han, Self-construal priming modulates neural substrates of self-awareness, Psychol. Sci. 18 (2007) 861–866, https://doi.org/10.1111/j.1467-9280.2007.01992.x.
[37] J. Sui, P. Rotshtein, G.W. Humphreys, Coupling social attention to the self forms a network for personal significance, Proc. Natl. Acad. Sci. U. S. A. 110 (2013) 7607–7612, https://doi.org/10.1073/pnas.1221862110.
[38] J. Sui, C.H. Liu, S. Han, Cultural di□erence in neural mechanisms of self-recognition, Soc. Neurosci. 4 (2009) 402–411, https://doi.org/10.1080/17470910802674825.