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Self-construal priming modulates the scope of visual attention

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Although it is well documented that cultures influence basic cognitive processes such as attention, the underlying mechanisms remain unclear. We tested the hypothesis that self-concepts that characterize people from different cultures mediate the variation of visual attention. After being primed with self-construals that emphasize the Eastern interdependent self or the Western independent self, Chinese participants were asked to discriminate a central target letter flanked by compatible or incompatible stimuli (Experiment 1) or global/local letters in a compound stimulus (Experiment 2). Experiment 1 showed that, while responses were slower to the incompatible than to the compatible stimuli, this flanker compatibility effect was increased by the interdependent relative to the independent self-construal priming. Experiment 2 showed that the interdependent-self priming resulted in faster responses to the global than to the local targets in compound letters whereas a reverse pattern was observed in the independent-self priming condition. The results provide evidence for dynamics of the scope of visual attention as a function of self-construal priming that switches self-concept toward the interdependent or independent styles in Chinese.

Keywords: Attention; Flanker compatibility effect; Global/local; Self-construal.

Traditional psychological research has examined the mechanisms of cognitive processes with the assumption that conclusions based on the results collected from one participant group can be applied to another participant group from a different culture (Kennedy, Scheier, & Rogers, 1984). However, recent studies have shown evidence for cultural difference in basic cognitive processes such perception and attention. For example, Americans perform better when detecting changes in salient objects whereas Japanese are better at finding changes in contexts (Masuda & Nisbett, 2001, 2006). Consistent with this observation, Americans made fewer mistakes on judgement of the orientation of a rod sitting inside a frame whereas East Asians were more likely to

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be affected by the position of the surrounding frame (Ji, Peng, & Nisbett, 2000). Relative to European Americans, East Asians were better at judging the relative length of a line in a contextual frame (Kitayama, Duffy, Kawamura, & Larsen, 2003), which was associated with modulation of neural substrates of attentional control (Hedden, Ketay, Aron, Markus, & Gabrieli, 2008). The findings of cross-cultural comparisons are in accordance with the proposition that the Western cognitive style is analytical, inclines to attend to salient objects, and makes attribution and prediction with reference to internal properties of objects, whereas the East Asian cognitive style is holistic, tends to attend to the field composed by objects, and makes attribution and prediction according to the relationship between a focal object and the field (Nisbett & Masuda, 2003; Nisbett & Miyamoto, 2005; Nisbett, Peng, Choi, & Norenzayan, 2001).

The difference in cognitive styles between Westerners and East Asians has been attributed to unique styles of self-concept. According to Markus and Kitayama (1991), the Western independent self is characterized as a self-contained and autonomous entity that is context independent and possesses salient internal attributes. The Eastern interdependent self, however, is treated as a member in a group and highlights belonging to and dependence upon a context. In addition, researchers suggest that both types of self-construal may coexist within the same individuals who can be primed to access relatively more independent or interdependent self-construals depending on contextual factors (Brewer & Garner, 1996; Gardner, Gabriel, & Lee, 1999; Kühnen, Hannover, & Schubert, 2001; Kühnen & Oyserman, 2002; Stapel & Koomen, 2001; Trafimow, Triandis, & Goto, 1991). However, although cross-cultural research has shown that the Western versus East-Asian cultural differences in basic cognitive processes correlate with the cultural difference in self-construals (Ji et al., 2000; Kitayama et al., 2003; Masuda & Nisbett, 2001, 2006), the findings do not convincingly demonstrate that the cultural differences in cognitive processes are due to the cultural difference in self-construals because other confounding variables such as language may influence the cross-cultural differences in cognitive styles (see Oyserman, Coon, & Hemmelmeier, 2002; Oyserman & Lee, 2008, for more discussion). Recently, Kühnen and Oyserman (2002) investigated whether processing style can be switched toward a context-independent or context-dependent manner by a self-construal priming (Gardner et al., 1999) that asked participants to circle the independent (e.g., I, mine) or interdependent (e.g., we, ours) pronouns in an essay. Such a priming procedure changed the proportion of interdependent self-construals (Brewer & Gardner, 1996) and resulted in a shift of world view toward collectivist or individualist social values after the interdependent and independent self-construal priming, respectively (Gardner et al., 1999), suggesting that the self-construal priming modulate self-concept styles. Kühnen and Oyserman's (2002) paradigm allows examination of the variation of cognitive styles as a function of shift of self-concept styles induced by self-construal priming and thus helps to clarify the causal link between cultural difference in self-construals and cognitive processes. They found that, relative to the participants exposed to interdependent self-construal priming, participants with independent self-construal priming performed better in the Embedded-Figures Test—which involves finding simple geometrical objects embedded in complex ones (Witkin, Oltman, Raskin, & Karp, 1971)—than in a picture completion task where the participant must find what is missing in a complex context. In addition, participants with independent self-construal priming responded faster to identification of a local letter than to the identification of a global letter in a Navon-type compound stimulus (Navon, 1977). A reverse pattern of performance was observed in participants who were exposed to interdependent self-construal priming. Kühnen and Oyserman (2002) argued that the self-construal priming results in a shift of processing mode with the independent self promoting context-independent cognitive process style and the interdependent self promoting context-dependent cognitive process style.

However, most of the previous studies adopted a between-subjects design to compare participants from different cultures (Ji et al., 2000; Kitayama et al., 2003; Masuda & Nisbett, 2001, 2006) or to compare two participant groups who were primed with different self-construals (Kühnen & Oyserman, 2002). The findings are supportive but not sufficient to conclude that the self-construals mediate different cognitive styles because other confounds may contribute to the between-subjects differences in cognitive processes such as attention. Moreover, with a between-subjects design it is difficult to determine how long lasting the priming effects are. The present study employed a within-subject design that allowed examination of the causal link between self-concept styles and variations of a specific cognitive function—that is, visual attention—in Chinese participants. Most of the effects of self-construal priming on human cognitions were reported for Westerners (see Osyerman & Lee, 2008, for review) except our recent study showing brain imaging evidence that self-construal priming modulated self-awareness during self-face recognition in Chinese participants (Sui & Han, 2007). We assessed whether visual attention can be modulated by self-construal priming in Chinese participants whose self-concept is dominated by the interdependent self-construals.

The "zoom lens" model of visual attention suggests that the size of the attention focus can be varied continuously (Castiello & Umiltà, 1990; Eriksen & St. James, 1986; Eriksen & Yeh, 1985). Previous research has shown evidence that the scope of visual attention can be modulated by emotional states such that trait anxiety results in a constriction of attentional focus (Derryberry & Reed, 1998) whereas positive affect increases the breadth of attentional selection (Rowe, Hirsh, & Anderson, 2007). The current work assessed whether self-construal priming that emphasizes the independent or interdependent self can alter the scope of visual attention in Chinese college students in Beijing who had many chances to be exposed to Western culture. Such cultural practices may produce a Western cultural imprint in their knowledge systems. Consequently, their self-construals may be characterized to a certain degree by Western culture, though Chinese culture may still dominate their knowledge systems. Experiment 1 employed a classic flanker task (Eriksen & Eriksen, 1974) that required participants to respond to a central target surrounded by nontarget stimuli (i.e., flankers). Typically, responses are faster when the flankers and the target are assigned to the same response in the compatible condition than when they are assigned to different responses in the incompatible condition (i.e., the flanker compatibility effect or FCE; Miller, 1987). It is commonly accepted that flanker letters do not receive the same full processing as attended target stimuli, and the FCE reflects the degree to which the flankers receive attentional processing (Johnston & Dark, 1982; Miller, 1987), a consequence of variation of the scope of visual attention. To examine the causal link between self-styles and the scope of visual attention, we compared the FCE in conditions where participants were primed with either the independent or the interdependent self-construals. If the independent self-style mediates a small scope of visual attention, we would expect smaller FCE effect (i.e., weakened attentional processing of flankers) after the independent than after the interdependent self-construal priming.

Experiment 2 utilized Navon-type compound letters (Navon, 1977) to investigate the effect of self-construal priming on visual attention. Participants were presented with a large letter composed of small ones and were asked to identify the global or local letters. It has been assumed that, relative to the identification of a local target, the identification of a global target requires enlarged scope of visual attention (Stöffer, 1994) to cover the global structure. In contrast, the local task required focused attention to segment individual local elements for discrimination (Han & Humphreys, 2002; Stöffer, 1994). If self-concept style indeed mediates the modulation of the scope of visual attention, we would expect that self-construal priming that emphasizes the independent or interdependent self would influence relative response speeds to the global and local targets. Specifically, the independent-self

priming should speed up local responses whereas the interdependent-self priming should accelerate global responses. Although Kühnen and Oyserman (2002) used compound stimuli to examine the effect of self-construal priming on responses to the global/local targets, they employed a between-subjects design and found faster responses to the global than to the local targets (a global precedence effect) in participants exposed to the interdependent self-construal priming but faster responses to the local than to the global targets (a local precedence effect) in participants with the independent self-construal priming. Because this design did not include a control priming condition, it is unclear whether the interdependent self-construal priming facilitates the global processing or the independent self-construal priming facilitates the local processing. In addition, the between-subjects design could not determine whether self-construal priming can produce bidirectional effects on cognitive processes in an individual participant, leading to facilitation of context-dependent processes by the interdependent self-construal priming and facilitation of context-independent processes by the independent self-construal priming. These issues were tested in Experiment 2 that used a within-subject design with a control priming condition. Taken together, results from Experiments 1 and 2 that employed different paradigms will help to confirm whether there is a stimulus-independent effect of self-construal priming on visual attention.

EXPERIMENT 1

Method

Participants

A total of 15 Chinese nonpsychology college students in Beijing (8 males, 7 females), aged 20–28 years (mean = 22.5), participated in Experiment 1 as paid volunteers. All were right-handed, had normal or corrected-to-normal vision, and were naïve to the purpose of this study. This study was approved by a local ethics committee at the Department of Psychology, Peking University.

Stimuli and procedures

Three Chinese essays were used in the priming procedure. Each essay consisted of two paragraphs describing a trip to countryside. One essay contained independent pronouns (e.g., I, mine), and one contained interdependent pronouns (e.g., we, ours). Participants were asked to read each paragraph and to circle the pronouns. One essay was used in the control condition and did not contain pronouns. Participants were required to read each paragraph and to circle specific nouns in it. The contents of the essays and order of the independent, interdependent, and control priming were counterbalanced across participants.

Stimuli used in the letter discrimination task were presented on a 15-inch monitor in a dim room. Each stimulus display consisted of two identical peripheral letters ("E" or "H") flanking a central target letter ("E" or "H"), one on each side, similar to those used in our previous work (Han & Humphreys, 2005). The stimuli were black (0.1 cd/m^2) against a grey background (44.0 cd/m^2). Each letter subtended a visual angle of $1.7^\circ \times 1.2^\circ$ (3 cm high and 2 cm wide) at a viewing distance of 100 cm. Letters were spaced 0.57° apart, with the target letter centred at the fixation. The flankers were the same as the target letter (i.e., "H H H" or "E E E") in half of the trials (compatible trials) but different from the target letter in others (i.e., "H E H" or "E H E"; incompatible trials).

A 2 × 3 within-subject design was used with the main effects being compatibility (flankers were compatible or incompatible with the target letter) and priming (independent, interdependent, or control essays). Participants were first primed with one of the three self-construal priming materials. Immediately after the priming procedure, participants performed a letter discrimination task. After 8 practice trials each participant completed one block of 120 trials. Each trial began with the presentation of a fixation cross for 1,500 ms, and a tone was presented during the last 100 ms of the fixation to signal

the presentation of the visual stimuli. A stimulus display consisting of three letters was shown for 150 ms, which was then masked by three grey rectangles of the same size as the letters, which lasted for 200 ms. The interstimulus interval between the letters and grey rectangles varied randomly between 250 ms and 350 ms. While being asked to fixate at the central fixation cross, participants were required to respond as fast and accurately as possible by pressing one of two buttons using left or right index fingers. After a 5-minute break, participants were primed using a different essay followed by another block of trials for the letter discrimination task. The whole experiment lasted for approximately 40 minutes.

Results and discussion

One participant was excluded from data analysis because of failure of data recording. Reaction times (RTs) associated with response errors or exceeding the mean by three standard deviations (*SD*s) were excluded from analysis. This resulted in the removal of 7.7% of the trials. Table 1 shows the mean RTs and response accuracies for each condition. RTs were subjected to repeated measures analysis of variance (ANOVA) with compatibility and priming as independent variables. We found a significant main effect of compatibility, $F(1, 13) = 66.76$, $MSE = 225.97$, $p < .001$, suggesting that responses were slower to incompatible (442 ms) than to compatible (415 ms) stimuli (i.e., the FCE). The main effect of priming did not reach significance, $F(2, 26) = 0.40$, $MSE = 463.12$, $p > .05$. However, there was a reliable interaction between compatibility and priming, $F(2, 26) = 5.29$, $MSE = 39.77$, $p < .02$, suggesting discrepant FCE between different priming conditions. To further validate this effect, the FCE indexed by the difference in RTs between incompatible and compatible trials was calculated in each priming conditions. Paired *t* test confirmed larger FCE after the interdependent than the independent priming (33.1 vs. 23.4 ms), $t(13) = 4.3$, $p < .001$, or the control priming (24.0 ms), $t(13) = 2.5$, $p < .03$. The FCE did not differ between the independent and control priming conditions, $t(13) = 0.19$, $p > .05$. Figure 1 illustrates the difference in FCE between the three priming conditions.

ANOVAs performed on response accuracies showed only a significant main effect of compatibility, $F(1, 13) = 8.89$, $MSE = 0.003$, $p < .02$; participants made more errors to the incompatible than to the compatible stimuli. Neither the main effect of priming nor its interaction with compatibility was significant.

The differential FCE observed in Experiment 1 suggests that self-construal priming modulates perceptual processing by enlarging the FCE in the interdependent relative to the independent and control priming conditions. Because the FCE reflects the degree of attentional processing of flankers (Eriksen & Eriksen, 1974), our findings indicate that the attentional processing of the flankers was enhanced in the interdependent priming relative to the independent priming conditions, supporting the proposal that self-construal priming influences the scope of visual attention. Interestingly, the influence of self-construal priming did not differ between the independent self-construal and control priming conditions.

Table 1. *Mean reaction times and response accuracy in Experiment 1*

		Priming		
		Independent	*Control*	*Interdependent*
RTs	Compatible	416.4 (52.4)	414.5 (56.9)	415.0 (56.8)
	Incompatible	439.8 (42.2)	438.5 (49.0)	448.1 (50.6)
Accuracy	Compatible	96.1 (4.1)	94.6 (7.2)	91.0 (11.3)
	Incompatible	91.8 (8.0)	91.0 (6.4)	88.6 (10.6)

Note: Reaction times (RTs) in ms; response accuracy in percentages; standard deviations in parentheses.

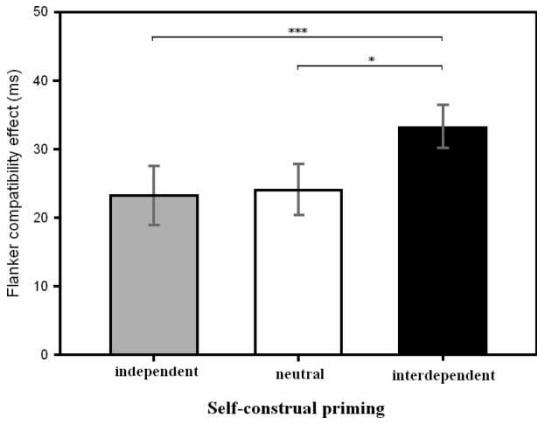

Figure 1. *Illustration of the modulation of the flanker compatibility effect (FCE) by self-construal priming. The FCE was indexed by the difference in reaction times (RTs) between incompatible and compatible stimuli (i.e., FCE effect = RTs to incompatible stimuli minus RTs to compatible stimuli. The positive FCE indicates faster RTs to compatible than to incompatible stimuli).*

It is possible that the task and stimuli used in Experiment 1 required participants to focus their attention on a small area of the visual field so as to exclude the flankers, as evidenced by the small flanker effect in the control condition. Consequently, such a small attentional window could not be narrowed further after the independent self-construal priming. Alternatively, the independent self-construal priming simply could not modulate the scope of visual attention in Chinese participants whose self-style is dominated by the interdependent view of the self. These were further investigated in Experiment 2.

EXPERIMENT 2

Method

Participants

A total of 30 Chinese nonpsychology college students in Beijing (8 males, 22 females), aged 20–28 years (mean = 20.2 years), participated in Experiment 2 as paid volunteers. All were right-handed, had normal or corrected-to-normal vision, and were naïve to the purpose of the study.

Stimuli and procedures

The priming procedures were the same as those in Experiment 1. The stimuli used in the discrimination task were global letters made up of local letters in a 4 × 5 matrix. A global letter subtended 3.2° × 5.4° (wide × high), and a local letter subtended 0.57° × 0.79° at a viewing distance of 80 cm. Adjacent local letters were spaced 0.36° apart, with the lines composing each local letter approximately 0.06° thick. Stimuli were black (0.1 cd/m^2) against a grey background (44.0 cd/m^2). Letters "H" and "S" served as targets whereas letters "A" and "E" served as distractors. The stimuli contained a target either at the global level (i.e., global/local letters were H/A, H/E, S/A, or S/E) or at the local level (i.e., global/local letters were A/H, A/S, or E/H, E/S), resulting in eight stimuli.

A 2 (target level: global or local) × 3 (priming: independent, interdependent, or control priming condition) within-subject design was used. Participants were first primed with one of the three self-construal priming materials. Immediately after the priming procedure, participants performed a letter discrimination task that required participants to discriminate target letters (H vs. S) at the global or local level of each compound stimulus. After 40 practice trials, each participant completed one block of 80 trials. Each trial began with the presentation of a fixation cross displayed for 1,500 ms. A compound letter was then shown for 400 ms. While being asked to fixate at the fixation cross, participants were asked to respond as fast and accurately as possible by pressing one of two buttons using the left or right index fingers. After a 5-minute break, participants were primed again and finished another block of trials. The experimental session lasted approximately 40 minutes. The contents of the essays and order of the independent, interdependent, and control priming were counterbalanced across participants.

Results and discussion

Correct RTs exceeding the mean by three standard deviations were excluded from data analysis, resulting in the removal of 3.8% of the trials. RTs and response accuracies were subjected to

ANOVAs with target level and priming as independent variables. Table 2 shows the mean RTs and response accuracies in each stimulus condition. ANOVAs of RTs failed to show significant main effect of target level, $F(1, 29) = 0.027$, $MSE = 2{,}769.50$, $p > .05$, and priming, $F(2, 58) = 0.035$, $MSE = 6{,}169.85$, $p > .05$. However, there was a highly significant interaction of Target Level × Priming, $F(2, 58) = 7.756$, $MSE = 455.26$, $p < .001$, suggesting that relative response speeds to the global and local targets were different in the three priming conditions. While global and local responses did not differ, RTs showed a global precedence in the interdependent priming condition but a local precedence in the independent priming condition. To further confirm the difference in global precedence effect in the self-construal and control priming condition, we calculated the RT difference between local and global targets (RTs to local targets minus RTs to global targets), which was then compared between the self-construal and control priming condition using paired t tests. This confirmed larger global precedence effect in the interdependent-self priming condition than in the independent-self priming condition, $t(29) = 3.881$, $p < .001$. In addition, the local precedence effect was larger in the independence priming condition than in the control priming condition, $t(29) = -2.164$, $p < .05$. However, the global precedence effect in the interdependent-self priming condition did not differ significantly from that in the control priming condition, $t(29) = 1.805$, $p = .081$. Figure 2 illustrates the difference in global precedence effect between the three priming conditions.

Table 2. *Mean reaction times and response accuracy in Experiment 2*

		Priming		
		Independent	*Control*	*Interdependent*
RTs	Global	595.3 (112.4)	584.6 (92.1)	576.2 (96.2)
	Local	578.3 (110.5)	584.0 (99.1)	589.9 (105.6)
Accuracy	Global	95.8 (4.5)	96.7 (4.0)	95.1 (4.7)
	Local	95.8 (4.0)	96.8 (3.9)	96.6 (3.2)

Note: Reaction times (RTs) in ms; response accuracy in percentages; standard deviations in parentheses.

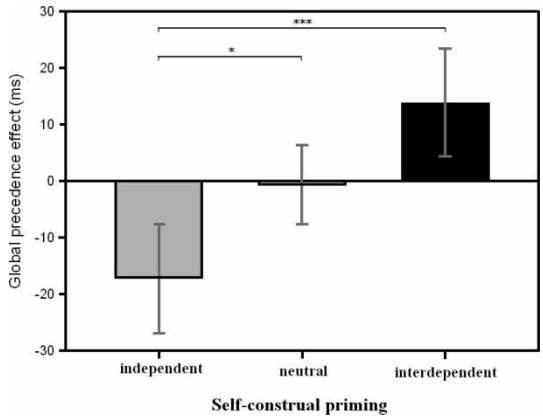

Figure 2. *Illustration of the modulation of global precedence effect by self-construal priming. The global precedence effect was indexed by the difference in reaction times (RTs) between global and local targets (i.e., global precedence effect = RTs to local targets minus RTs to global targets. The positive global precedence effect indicates faster RTs to global than local targets).*

ANOVAs performed on response accuracies did not show any significant effect—target level, $F(1, 29) = 0.53$, $MSE = 0.002$, $p > .05$; priming, $F(2, 58) = 1.532$, $MSE = 0.001$, $p > .05$; interaction of Target Level × Priming, $F(2, 58) = 0.914$, $MSE = 0.001$, $p > .05$—suggesting that there was no trade-off between speed and accuracy in these conditions.

Experiment 2 provided further evidence for the variation of visual attention as a function of self-concept styles that were modulated by self-construal priming. We showed that, while the global and local responses did not differ in the control priming condition, the interdependent self-construal priming resulted in faster global than local responses. In contrast, the independent self-construal priming gave rise to faster local than global responses. Because these results were obtained in one monocultural participant group, our findings indicate that self-construal priming can generate bidirectional influences on the scope of visual attention. The attentional scope enlarged by interdependent self-construal priming facilitated responses to the global target. In contrast,

the attentional scope reduced by independent self-construal priming assisted responses to the local target. Thus it appears that both interdependent and independent self-construal priming can modulate the scope of attention of Chinese participants.

GENERAL DISCUSSION

Cross-cultural studies suggest that cognitive styles are different between Westerners with dependent self-construals and East Asians with interdependent self-construals (Ji et al., 2000; Kitayama et al., 2003). Unlike the cross-cultural studies, the present work combined a within-subject design and self-construal priming to test the causal link between self-construals and the variation of the scope of visual attention. Our findings provide evidence that shift of self-concept styles induced by the self-construal priming plays a crucial role in modulation of visual attention. Because both independent and interdependent self-construal can be activated to a certain degree at any given point of time (van Baaren, Maddux, Chartrand, de Bouter, & van Knippenberg, 2003), we used self-construal priming to shift an individual's self-concept toward the independent or interdependent self and examined how such self-construal priming modulated the behavioural performances that index the variation of visual attention. Given that there is evidence for a correlation between the interdependent-self and context-dependent cognitive process style and between the independent-self and context-independent cognitive process style (Kühnen & Oyserman, 2002), we predicted that interdependent self-construal priming would increase the scope of visual attention whereas the independent self-construal priming would produce opposite effects.

Our predictions were tested in two experiments that used different stimuli and paradigms. We recruited nonpsychology students so that the participants could not guess the objectives of our study. To avoid any possible confounds of learning or practice with the effect of priming, the order of the independent, interdependent, and control priming were counterbalanced across participants. Experiment 1 used a flanker task (Eriksen & Eriksen, 1974) and found that, compared with independent self-construal priming, interdependent self-construal priming resulted in a larger FCE, an index of increased scope of visual attention that induced better attentional processing of flankers. The absence of the differential FCE between the independent self-construal and control priming conditions suggests that the focus of visual attention was shrunk by the task and stimuli to a degree that it could not be reduced further by the independent self-construal priming. Experiment 2, which utilized global/local tasks that required participants to identify targets at the global or local level of compound letters, showed that interdependent and independent self-construal priming conditions produce opposite effects on the scope of attention in Chinese participants. We found that, while responses were equally fast to the global and local targets in the control priming condition, responses were faster to the global than to the local targets in the interdependent self-construal priming condition but were faster to the local than to the global targets in the independent self-construal priming condition. Our findings were different from those of the previous study (Kühnen & Oyserman, 2002) in that the effects of self-construal priming on the responses to the global and local targets were obtained in one participant group. The results of Experiments 1 and 2 together indicate that the interdependent self-construal priming enlarges the scope of attention relative to independent self-construal priming.

Previous research on cultural difference in attention has typically compared performances from two participant groups (Nisbett & Miyamoto, 2005). While these studies suggest a broad scope of visual attention in East Asians with the dominant interdependent self-construal but a narrow scope of visual attention in Americans with the dominant independent self-construal, this between-subjects design is confounded by variables that covary with cultures (such as language) and thus leaves it an open

issue whether self-construal difference mediates such cultural difference in attention. Other studies that primed different participant groups using independent or interdependent self-construals likewise leave ambiguity over whether the two self-styles may coexist within an individual and can be shifted toward the interdependent or independent self-style to influence visual attention (Gardner et al., 1999; Kühnen et al., 2001; Kühnen & Oyserman, 2002; van Baaren et al., 2003). The findings of the current study indicate that switch of self-concept styles induced by self-construal priming can temporally change the scope of visual attention in one monocultural participant group. In addition to supporting the assertion that self-construal is not rigid but manipulable (Baumeister, 1998; Oyserman, 2001), our results also indicate that such temporal switch of self-concept styles can generate qualitatively different consequences on the cognitive process style and provide evidence for a direct causal link between self-construal and the scope of visual attention. Together with previous studies of Western participants (e.g., Gardner et al., 1999; Kühnen & Oyserman, 2002), our findings from Chinese participants suggest that, although self-concepts are different between Western and East Asian cultures (Markus & Kitayama, 1991), modulations of self-construals by short-term priming manifest human psychological universals. These findings support the postulate of the existence of both culturally sensitive (Nisbett & Miyamoto, 2005) and culturally invariant (Norenzayan & Heine, 2005) cognitive processes.

Although the current work suggests that self-construal priming can affect visual attention as indexed by the priming effects on behavioural performances, it remains unclear at which stage the neural processing is modulated by the priming procedure. Our recent studies showed evidence that the effect of self-construal priming may occur at different levels of neural processes. In an event-related brain potential study, Lin, Lin, and Han (2008) found that independent self-construal priming resulted in increased extrastriate activity to local than global targets whereas interdependent self-construal priming produced opposite effects. Sui and Han (2007) also found functional magnetic resonance imaging (fMRI) evidence that activity in the right frontal cortex that mediates self-awareness induced by self-face recognition was increased by independent relative to interdependent self-construal priming. These findings suggest that self-construal priming can modulate neural activity at multiple levels, and the effects of self-construal priming on the behavioural performances observed in the current study may possibly arise from the modulation of early visual activity.

The findings of the current research are consistent with other findings that visual attention is substantially modulated by cognitive strategy. Smilek, Enns, Eastwood, and Merikle (2006) recently observed that some difficult visual searches could be improved by instructing participants to relax and to adopt a passive cognitive strategy. Similarly, Olivers and Niewenhuis (2006) found that, while participants showed an impaired ability to identify the second of two targets presented in close succession, this attentional blink effect was reduced when participants viewed pictures of positive affective content or performed an additional memory task. These observations indicate that a temporary change of cognitive strategy (i.e., under- or over-investments of attentional resources in stimulus processing) can greatly influence the performances on attention tasks. Our observations that self-construal priming influenced the scope of visual attention complement these studies by showing evidence for the connection between self-concept styles and cognitive strategy.

Interestingly, our results were obtained from Chinese participants who are believed to be dominated by the interdependent self-style (Markus & Kitayama, 1991). Our Experiment 1 showed that interdependent self-construal priming produced a stronger effect on variation of the scope of visual attention than did independent self-construal priming. Experiment 2 showed that the self-style could be shifted towards the interdependent or independent self by self-construal priming even in Chinese participants, which in turn induced enlarged or decreased scope of visual attention

and resulted in either a global precedence or a local precedence effect. The results suggest that, although the interdependent self-concept dominates in East Asians (including Chinese), the independent self-concept may coexist to a certain degree in them. Such a mixture of independent and interdependent self-construals can be switched by self-construal priming and consequently modulate visual attention.

Our Experiment 1 identified a reliable effect of interdependent priming but not of independent priming whereas Gardner et al.'s (1999) observed stronger effect of the priming of independence in Asian participants than of the priming of interdependence. Gardner et al. attributed the weaker effect of interdependent self-construal priming to the fact that the interdependent self-knowledge is chronically accessible to Asian participants. Gardner et al. (1999) measured the influence of self-construal priming on the endorsement of collectivist or individualist values in students in Hong Kong who are supposed to be bicultural individuals (Hong, Morris, Chiu, & Benet-Martinez, 2000). We, however, measured how self-construal priming affected visual attention in students in Beijing. These findings together indicate that self-construal priming toward both independent and interdependent self-concepts may influence cognitions in East Asians, though the salience of different type of priming on high-level social cognition and basic cognitive processes may differ.

While the findings of cross-cultural studies indicate cultural differences in basic cognitive processes (Ji et al., 2000; Kitayama et al., 2003), the present research complemented the previous research by showing evidence for the flexibility of cognitive styles in individuals. Such individual differences ask for rethinking of the tendency to treat cultural difference as something relatively stable and fixed, since the way thinking of oneself as independent or interdependent can be shifted and can thus affect cognitive processes. Culturalization is not only a process of belief, attitude, and emotion parenting, but also a process of cognitive processing style nurturing.

Although our findings suggest that such self-construal priming indeed modulates self-concept style, the findings suggest that a shift of self-construal is sufficient rather than necessary to modulate the patterns of visual attention since we did not demonstrate that self-construal priming changes the pattern of attention in any conditions. As the current work recruited only Chinese participants, it is unknown whether self-construal priming also influences the scope of visual attention in Westerners whose self-style is dominated by the independent self. One possibility is that the independent self is less susceptible to external influence, and thus the self-style in Westerners may not be affected by the self-construal priming. This would predict absence of modulation of visual attention by self-construal priming in Westerners. Alternatively, Westerners' self can be shifted toward the interdependent style, which in turn induces increased scope of visual attention. Finally, as the participants in our study were from highly educated populations in China and had more exposure to Western culture than the general Chinese public, it is unknown to what extent our findings can be applied to general Chinese public, which should be examined in future research.

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