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Original Article

When norm violations are spontaneously detected: an electrocortical investigation

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Abstract

One fundamental function of social norms is to promote social coordination. Moreover, greater social coordination may be called for when tight norms govern social relations with others. Hence, the sensitivity to social norm violations may be jointly modulated by relational goals and a belief that the social context is tight (*vs* loose). We tested this analysis using an electrocortical marker of norm-violation detection (N400). Ninety-one young American adults were subliminally primed with either relational or neutral goals. Then they saw behaviors that were either norm-violating or normal. In the relational priming condition, the norm-violation N400 increased as a function of the perceived tightness of societal norms. In the control priming condition, however, the norm-violation N400 was weak regardless of perceived tightness. Thus, normative tightness was associated with increased neural processing of norm violations only when relational goals were activated. Implications for norm psychology are discussed.

Key words: tightness, relational orientation, norm violation, social norms, N400

Introduction

Social coordination is realized through social rules that govern various settings. These rules, herein called social norms, are instrumental in regulating interpersonal relations and enabling humans to form broad social groups that go beyond immediate kin (Henrich, 2015; Norenzayan *et al.*, 2016). Norms ensure the efficient functioning of social systems while protecting members of society against various threats (e.g., germ contamination and traffic accidents). It is not surprising then that people sometimes become highly sensitive to norm violations, thereby spontaneously taking note of them. This sensitivity to social norm violations is a crucial step in mobilizing norm-based regulation of social behaviors (Gavrilets and Richerson, 2017). Despite the crucial significance of norm violation detection as a building block for theories of social norms, however, little is known about factors determining the likelihood of the spontaneous detection of norm violations.

In the current work, we adopted the N400—an event-related potential (ERP) component—as a reliable marker of the spontaneous detection of norm violations. N400 responds to the violation of semantic expectations in general (Rabovsky *et al.*, 2018) and the violation of social norms in particular Mu *et al.* (2015). Building on the thesis that norms are utilized for social

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coordination, we hypothesized that norm violations would capture attention when two conditions are met. First, the person must be prepared to relate to others socially. Second, the person must believe that the norms of his or her society are tight and rigid. We expected that when these two conditions are met, the N400 response to norm-violating (*vs* normal) behaviors should be particularly strong. Moreover, to show that the modulation of norm-violation detection occurs without any deliberate decision-making, we primed the relational goals unobtrusively with a subliminal priming procedure.

Tightness *vs* looseness belief and relational goals

Recently, Gelfand *et al.* (2011) have demonstrated that people vary substantially in their belief that the norms of their society are tight or loose (referred to as tightness/looseness (T/L) belief). Some individuals are 'tight' in the sense that they perceive the range of permissible behaviors to be relatively narrow. For these individuals, social norms are unequivocal, and there is little leeway to deviate from them. Accordingly, the detection of norm violations could come about easily and quickly and, thus, relatively spontaneously. In contrast, some other individuals may be 'loose' in the sense that they see a much wider range of permissible behaviors. For these individuals, social norms are ill-defined, and therefore, it may not be as easy to determine the violation of such norms. Thus, even when another's action seems to clearly violate relevant norms in the eyes of 'tight' individuals, the judgment may not be clear-cut for 'loose' individuals. For the latter individuals, the judgment will be slower, less spontaneous, and perhaps more deliberate.

At first glance, the predicted effect of the T/L belief on norm-violation detection might seem straightforward. However, this effect may not always be observed. Norms are abundant, and the applicability of the norms may vary from one situation to the next. Hence, pertinent norms may have to be judged relevant and, thus, made accessible, or 'brought online', before the perceived T/L of the norms influences the detection of norm-violating behaviors. Only when the norms are judged to be relevant, will they be attended to. This theorizing is consistent with prior evidence that information receives more attention if it is relevant to the social perceivers' goals than if it is not (Montagrin *et al.*, 2013; Sakaki *et al.*, 2014). Moreover, the possibility that T/L beliefs have consequences on behavior only when they are relevant is consistent with age-honored theories of motivation (Kruglanski *et al.*, 2014), which assume that beliefs are often dormant or inert in and by themselves. Such beliefs (called 'expectancy') are engaged to guide actions only when they are made relevant to the needs and goals of the person (called 'value'). Accordingly, we hypothesized that the T/L belief would increase the likelihood of spontaneously detecting norm violations, primarily when this belief was relevant to the demands of the immediate social situation. In other words, norm violations may be expected to capture one's attention when the person holds the goal of relating to others and believes the pertinent norms are tight.

The foregoing prediction is consistent with the prior work emphasizing the function of social norms to coordinate social interactions (Gelfand *et al.*, 2011; Morris *et al.*, 2015). To begin, consider a case where there is no need to engage socially, such as when one studies alone in a dorm room. Under such conditions, there will be no need for social coordination, and as a consequence, social norms will prove hardly relevant to the person, regardless of whether they are tight or loose. Next, consider a case in which people have a goal to relate to others, as when two people are about to engage in a discussion. Under such a condition, the two individuals feel a need for social coordination, thereby making social norms more relevant. Moreover, under such circumstances, the need for social coordination would be greater if the norms were tight. In fact, if the norms are perceived to be loose, norm adherence will not be called for. We may thus expect that when there is a goal of socially relating to others in a context governed by tight social norms, norm adherence will become a priority to the individuals. It would follow that norm violations should capture the attention of people primarily when they have a goal of relating to others while perceiving the pertinent norms to be tight.

Of importance, research in social cognition shows that relational goals are a powerful source of motivation (Baumeister and Leary, 1995). However, this motivation does not need to be conscious or deliberate. Indeed, it often is implicit. The prior work has found that one reliable method to induce relational goals is through priming the goals unconsciously with the subliminal presentation of relational words, such as 'together' and 'friend' (Bargh and Chartrand, 1999; Lakin and Chartrand, 2003; Kimel *et al.*, 2012). In one early study, Lakin and Chartrand (2003) found that after subliminal relational priming, individuals imitated their interaction partners more. This priming also increased cooperative behavior (Bargh *et al.*, 2001; Chartrand *et al.*, 2006). Moreover, a subsequent study showed that after this priming, Americans experienced dissonance for a choice they made for their friends even though they typically do not (Kimel *et al.*, 2012). This subliminal priming procedure has proven reliable, does not require conscious deliberation, and therefore minimizes demand effects that could be present with explicit goal priming. Thus, we elected to use this subliminal procedure of inducing relational goals and tested the prediction that relational goals increase the sensitivity to norm violations only for those who believe relevant norms to be tight.

Present study

To test the extent to which norm violations are spontaneously detected, we followed earlier work (Mu *et al.*, 2015) and used an ERP component called N400, a negative deflection of electrocortical potential occurring at ~400 ms. Since N400 signals a variety of expectancy violations, including semantic incongruities (Goto *et al.*, 2010; Kutas and Federmeier, 2011; Na and Kitayama, 2011), it may also capture a mismatch between observed behavior and the relevant social norms. Importantly, the N400 in response to norm violations is empirically distinct from the semantic incongruity N400 (Mu *et al.*, 2015). Thus, it is likely to be modulated by various sociocultural variables in ways that are unlikely for the semantic incongruity N400. We anticipated that the norm-violation N400 would be stronger under relational priming for those who believed the norms of their society to be tight (*vs* loose).

Methods

Participants

We tested European American undergraduates at the University of Michigan. They received either course credit or $20 compensation. The prior work using a similar norm-violation N400 paradigm (Mu *et al.*, 2015) found a systematic US–China difference with a total *n* of 50. Since we tried to capture a potentially

subtler priming effect within a single culture, we sought to double the *n* by testing a minimum of 100 participants. Since we anticipated that some participants would have to be excluded by pre-set criteria, we collected as many participants as possible by the end of the semester. After 44 participants had been tested, we instituted a double-blind procedure. In this procedure, a research assistant randomly assigned any given participant to a priming condition by opening a computer program that was labeled with words not associated with the prime. This ensured that the experimenter was unaware of the priming condition in which the participant was tested.

We tested 108 participants, out of which 17 were excluded before analysis for neurological medication use (9), head injuries and (4) excessive noise in ERP data as determined with standard artifact rejection criteria (3) (Luck, 2014). Additionally, one participant who did not follow an instruction 'to choose strongly disagree' while filling out post-experimental questionnaires (an attention check included) was also excluded. This resulted in a total of 91 participants, 45 females and 46 males, from 18 to 34 years of age ($M = 19.11$, $s.d. = 2.11$). The exclusion was no different across conditions and left 44 participants in the relational priming condition and 47 in the control priming condition. For all the participants included, valid electroencephalogram (EEG) data were available for at least a half of the trials in each of the conditions.

Procedure

After providing informed consent, participants were set up for EEG recording. They then completed a locator task, which was used to subliminally induce relational goals (Bargh and Chartrand, 1999; Lakin and Chartrand, 2003; Kimel *et al.*, 2012). Participants were told that they would see a flash on the computer display and asked to report the location (left or right) of the flash using the arrow keys on the keyboard. The flash consisted of a 62 ms presentation of a word, followed by a mask, 'XQFBZRMQWGBX', for another 62 ms. With this presentation, the prime was expected to be subliminal (Kimel *et al.*, 2012). Participants had been randomly assigned to one of the two priming conditions. In the relational priming condition, all the four priming words were relational (friend, partner, together and affiliate). In the control condition, they were not (table, neutral, room and vertical). There was a total of 80 trials, with each of the 4 words presented 20 times in a random order.

The locator was followed by a norm-violation judgment task. As shown in Figure 1, each trial started with a fixation point ('+') presented for 750 ms at the center of the computer screen. Then, a word or phrase representing a location or situation (e.g. bike lane) was presented for 1000 ms, followed by another fixation point for 750 ms, after which a picture of that location or situation was shown. 2000 ms afterward, a word representing a behavior (e.g. cycling) was superimposed on the picture for 900 ms. Participants had been instructed to imagine someone performing the behavior in the location or situation (e.g. 'cycling on the bike lane'). Then, a prompt appeared on the screen, upon which participants reported how violating the behavior would be in the situation by choosing a number from a 4-point rating scale ranging from (1 = not violating, 4 = very violating). Before the response prompt, there was an 800 ms interval to ensure that the response would not interfere with ERPs evoked by the behavior. Immediately after the judgment, the fixation cross for the next trial appeared on the screen.

A total of 34 situation–behavior pairs were adopted from Mu *et al.* (2015). To preclude any potential confounds due to the behaviors tested, we used the same set of behaviors in the three behavior type conditions. Each behavior was made either normal, weakly violating, or strongly violating by being paired with different situations. For example, 'cycling' is normal in a 'bike lane', but weakly violating and strongly violating in 'sidewalk' and 'freeway', respectively. Each of the 34 behaviors was used three times in each of the norm-violation conditions. 10 of the situation–behavior pairs of each of the 3 conditions were randomly repeated to increase the total number of trials, which yielded a total of 132 trials. The order of the 132 trials was randomized for each participant.

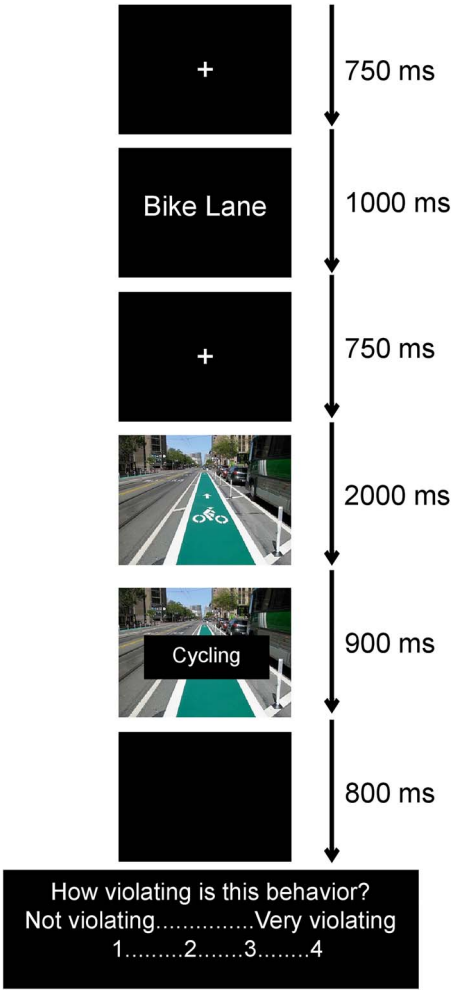

Fig. 1. Trial structure for the norm-violation task.

After the norm-violation judgment task, participants were reminded of the locator task and asked if they saw anything in each of the flashes during that portion of the task. Further, when we instituted the double blind priming procedure (after having tested 44 participants), we also included a forced recognition test for the priming words. Participants were given a list of 32 words, of which they had to select the 4 words that they felt had been presented during the locator task. They were asked to make the best guess if they were unsure. The participants then filled out a packet of questionnaires. The packet included the 14-item T/L in the US scale (Gelfand *et al.*, 2011). Participants reported their agreement with items, such as 'There are many social norms that people are supposed to abide by in the USA' and 'People in the USA almost always comply with social norms', on a 6-point

scale (1 = strongly disagree, 6 = strongly agree). For exploratory purposes, we also included a modified version of the Singelis Self-Construal scale (Park and Kitayama, 2014). Additional scales included for exploratory purposes came from Mu *et al.* (2015). They are measures of constraint in daily life, preference for territorial defense, creativity, vertical/horizontal individualism/-collectivism scale, T/L in daily life scale, Rosenberg self-esteem scale and Mattick social anxiety scale. Participants also reported on several demographic questions.

EEG recording and processing

EEG was recorded with 32 channel electrodes using the BioSemi ActiveTwo system. Six external electrodes were used for ocular correction. The data were digitized at the rate of 512 Hz and resampled at 256 Hz and then offline re-referenced to the average of the two mastoids. The data were analyzed using MATLAB with EEGLAB plugin and ERPLAB extension. An offline Butterworth filter with a low pass of 20 Hz and a high pass of 0.1 Hz was applied. Then, the data were segmented 200 ms pre-stimulus baseline and 800 ms post-feedback (1000 ms in total) and baseline-corrected before the presentation of the stimulus. Before artifact detection, the data were visually inspected for bad electrodes, which were subsequently interpolated using spherical interpolation. Trials were rejected if they exceeded +/− 100mv as determined with a 200 ms moving window with a 50 ms step threshold, if they fluctuated more than 30mv between two sampling points or if they had little to no activity (under 0.5 mv) over the course of the trial. Trials with blinks occurring +/−100 ms around the onset of the stimulus behavior were removed to ensure that the behavior was appropriately attended. All other trials containing blink ocular artifacts were corrected based on a commonly used algorithm (Gratton *et al.*, 1983).

Our primary analysis was focused on the central–parietal electrode sites (Cz, CPz and Pz), since this is where previous studies have consistently analyzed the N400 component (Kutas and Federmeier, 2011; Na and Kitayama, 2011). Following Na and Kitayama (2011), we first visually determined the tallest peak across all conditions (390–490 ms). The mean amplitude was extracted across the three conditions (normal, weakly violating and strongly violating) for the N400 using a time window +/− 50 ms around the average peak latency (390–490 ms). The mean amplitudes for the three behavior type conditions, computed for each participant, were used as a dependent variable in further analyses. The data were extracted the same way for frontal electrode sites (Fz and FCz), which showed a nearly identical peak latency (438 ms). To keep the analysis consistent, we used the same time window (390–490 ms). Greenhouse–Geisser corrections were used to adjust for the heterogeneity of variance when necessary. We used trial-wise data to estimate the reliability of N400, which proved reasonable, with Cronbach's alpha = .88. De-identified data, scripts and E-Prime programs are available at https://osf.io/w7x59/?view_only=638fe0847d8843f9bd2a2a2f020bdfa9.

Results

Subliminal nature of the relational priming

After the norm-violation task, participants were reminded of the locator task and asked if they saw anything during that portion of the task. Most participants reported that they saw something 'behind' the flash. However, no one mentioned any of the words presented in the priming procedure when urged to guess. Further, in the forced recognition test (available for 52 of the participants), neither relational nor control words were picked any more often than chance, regardless of the priming conditions, $t_{relational\ words}(23) = -1.696$, $P = 0.103$, and $t_{control\ words}(23) = -0.624$, $P = 0.539$ in the relational priming condition and $t_{relational\ words}(27) = 0.273$, $P = 0.787$ and $t_{control\ words}(27) = -0.902$, $P = 0.375$ in the control priming condition.

T/L belief and norm-violation ratings

The overall mean of the T/L belief scale was significantly higher than the scale midpoint of 3.5 ($M = 3.70$, *s.d.* = 0.65), $t(90) = 2.94$, $P < 0.005$. The T/L belief was no different between the two priming conditions, $t(89) = 0.518$, $P = 0.606$. In addition, the mean for independent self-construal was significantly higher than that for interdependent self-construal (*Ms* = 5.21 and 4.82), $t(90) = 3.46$, $P < 0.001$, as is typical in American samples.[1] No other effect of priming approached statistical significance on the self-report scales.

Next, we examined norm-violation ratings during the norm-violation judgment task. Strongly violating behaviors were perceived as most violating ($M = 2.90$) and normal behaviors, as least so ($M = 1.10$), with the weakly violating behaviors falling in-between ($M = 2.07$). The main effect of behavior type was highly significant, $F(2,87) = 27.90$, $P < 0.001$, $\eta p2 = 0.243$. All three means were statistically different from each other. There was also a significant behavior type by T/L belief interaction, $F(2,87) = 7.89$, $P < 0.001$, $\eta p2 = 0.083$. The average norm-violation rating for the strongly and weakly violating behaviors combined was significantly predicted by T/L belief, $r(91) = 0.347$, $P < 0.001$. However, the rating for the normal behaviors was not, $r(91) = 0.109$, $P = 0.306$. This pattern was no different in the relational priming ($rs = 0.249$ and 0.077, for the norm violation and normal behaviors, respectively) and control priming conditions ($rs = 0.432$ and 0.128, for the norm violation and normal behaviors, respectively). Of note, the behavior type x T/L belief x prime interaction was negligible, $F(2,87) = 1.19$, $P = 0.306$, $\eta p2 = 0.013$. We will return to the absence of the interaction pattern we predicted on this self-report measure in the Discussion.

ERPs

Waveforms from all 32 cortical electrodes for each condition are in Figure S1. Preliminary analyses showed no difference between the strongly and weakly violating behavior conditions (Figure 2A). Hence, the two norm-violating behavior conditions were collapsed. Moreover, our central interest was in the extent to which people become sensitive to norm violations. Thus, the average N400 at central–parietal sites for the normal behavior condition was subtracted from the N400 in the two norm-violation conditions combined to yield the relative magnitude of N400 for the norm-violation (*vs* normal) behaviors. This relative N400 was analyzed with two between-subject variables (prime and T/L belief) and the interaction between them. This analysis yielded a significant main effect of prime, $F(1,87) = 5.29$, $P = .024$, $\eta p2 = 0.057$. The norm-violation N400 was greater in

1 The mean interdependence score tended to be higher in the relational (*vs* control) priming condition (*Ms* = 4.92 and 4.72). The difference was statistically only marginal, $t(89) = 1.64$, $P = .052$, with a one-tailed test. Nevertheless, the pattern is consistent with earlier evidence that priming of social relations increases interdependent orientations (Gardner *et al.*, 1999).

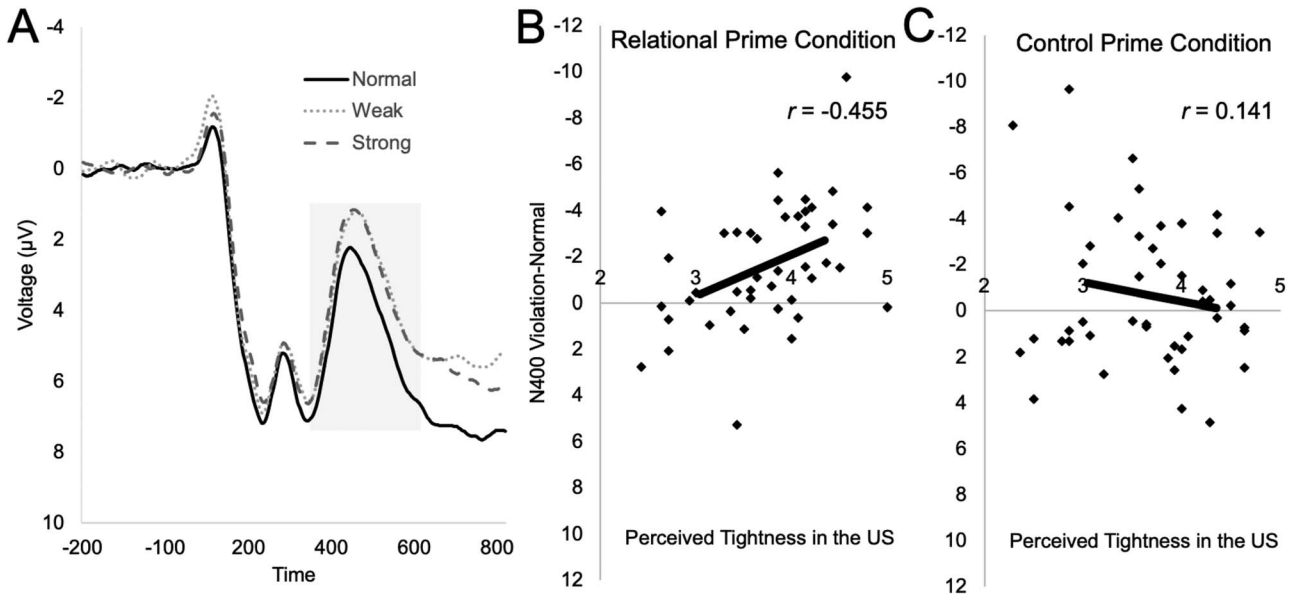

Fig. 2. A. The ERP waveform at the Cz electrode combined across conditions. The N400 is marked with a gray shadow. B and C. The magnitude of N400 as a function of T/L belief in the relational and control prime conditions.

the relational priming condition ($M = -1.61$) than in the control priming condition ($M = -.52$). Importantly, the prime main effect was qualified by an interaction with T/L belief, $F(1,87) = 6.86$, $P = .010$, $\eta p2 = 0.073$. T/L belief significantly predicted a greater norm-violation N400 in the relational priming condition, $r(44) = -0.455$, $P = 0.002$ (Figure 2B). This effect, however, was negligible in the control priming condition, $r(47) = 0.141$, $P = 0.344$ (Figure 2C). Next, we tested the effect of priming at the high *vs* low levels of the T/L belief. For those 1*s.d.* above the mean of the T/L belief, the norm-violation N400 was significantly greater in the relational (*vs* control) priming condition, $F(1,87) = 8.39$, $P = 0.005$, $\eta p2 = 0.088$. For those 1*s.d.* below the mean of T/L belief, however, the difference between the two priming conditions was negligible, $F(1,87) = 0.082$, $P = 0.776$, $= 0.001$.

The T/L belief x prime interaction was not qualified by the use of the double-blind procedure. When the double-blind procedure was used as an additional independent variable, the prime main effect was significant, $F(1, 86) = 6.31$, $P = 0.014$. As was the prime by T/L belief interaction, $F(1, 86) = 7.98$, $P = 0.006$. The current results did not depend on a few possible outliers apparent in Figure 2B and C (see Supplementary Analysis 1). Moreover, the effects we report were no different when the random effects for electrodes and stimuli were included (see Supplementary Analysis 2).

The prior work (Mu *et al.*, 2015) found a cultural difference in the norm-violation N400 primarily in the frontal regions. We therefore repeated the same analyses on the frontal midline electrode sites, Fz and FCz, testing the N400 in the norm-violation (*vs* normal) condition as a function of both prime and T/L belief. The pattern was very similar in these frontal electrodes as in the main analysis (see Supplementary Analysis 3).

Correlations

Lastly, we explored whether the norm-violation N400 might correlate with variables known to be linked to T/L belief used in Mu *et al.*, including constraint in daily life, preference for territorial defense, creativity and SES. Regardless of the priming condition, none of the correlations achieved statistical significance plausibly because of the narrower range of variability of the variables within a single culture.

Discussion

The current work is the first to show that norm violations are spontaneously detected when those who believe the norms of their society to be tight are primed with relational goals. The norm-violation N400 was upregulated when those who believed their societal norms to be tight were subliminally primed to relate to others. This pattern offers a few important implications for theories of social norms.

Norms and social coordination

We demonstrated that an electrocortical marker of norm-violation detection (N400) is jointly modulated by subliminal relational priming and the T/L belief of societal norms. This finding suggests that the T/L belief in and by itself may not be sufficient to increase the likelihood of spontaneously detecting norm violations. It may need to be made motivationally relevant, thereby providing further support to many motivational theories of social cognition and social behavior (Kruglanski *et al.*, 2014). Specifically, when the norms are made relevant by relational goals, they are 'brought online'. The resulting accessibility of social norms is assumed to mediate the increased N400. Our finding is in line with a functionalist view of social norms. This view emphasizes the role of social norms in achieving effective social coordination (Gelfand *et al.*, 2011; Morris *et al.*, 2015). Hence, the neural processing of norm violations is spontaneous when the need for social coordination is maximized by a requirement to socially relate to others under tight norms.

Online norm processing

Of note, we unobtrusively primed relational goals and showed that these goals influence the norm-violation N400. This finding suggests that the regulation of norms, involving both goal-dependent retrieval of norms and the norm-based evaluation

of the focal behaviors, can occur subliminally, outside of conscious awareness. This finding is consistent with the current understanding of the psychological unconscious as versatile and adaptive (Bargh and Morsella, 2008). Equally important, the current demonstration validates the subliminal priming procedure (Bargh and Chartrand, 1999; Lakin and Chartrand, 2003; Kimel *et al.*, 2012), thereby informing the debate of the replicability of social priming effects (Pashler *et al.*, 2013; Payne *et al.*, 2016). Nevertheless, the claim that priming words were subliminal was based on self-report and forced-recognition performance after the norm-violation judgment task. This claim could be challenged since we could not preclude the possibility that participants were aware of the priming words momentarily when the words were flashed. Although we found this possibility rather unlikely, future work must test the subliminal status of priming words right after the words are flashed.

It is worthy of note that the T/L belief x prime pattern is unique to the N400 index. When self-report of the severity of norm-violation was tested, it became more extreme as a function of the T/L belief regardless of relational priming. Whereas the N400 is based on early processing in the order of a fraction of a second (i.e. around 400 ms post-stimulus), self-report operates in the order of several seconds. Hence, in the control condition, even if the norms were not accessible early on during the processing when the behavior was first detected (thereby showing no N400 difference), it could be retrieved at a later time, when the norm congruity of the behavior was evaluated after the fact (Kahneman and Miller, 1986).

Cross-cultural implications

The current finding offers important cross-cultural implications. First, prior evidence shows that Asians including Chinese and Japanese are more likely to perceive the norms of their society to be tight than North Americans do (Gelfand *et al.*, 2011). Second, Asians are more interdependent than Americans, and therefore, Asians may be more likely than Americans to hold relational goals (Markus and Kitayama, 1991). In combination, these two factors (the belief of norms to be tight and active relational goals) may lend themselves to a stronger norm-violation N400 (Mu *et al.*, 2015). Our work then may be instrumental in 'unpacking' the complex effect of culture by offering an important clue for active dimensions of culture that are responsible for the group difference that has been observed.

Limitations and future directions

We wish to acknowledge some limitations of the current work. First, our work focused exclusively on N400, without any effort to link it to behaviors designed to cope with norm-violating behaviors. Future work must test whether the current neural indicator would predict future behavioral responses (e.g. punishment) to the norm violators. Second, in the current study, participants had an explicit goal of judging whether the behavior is norm-violating. Hence, the detection of norm violations demonstrated in the current work may turn out to be contingent on this processing goal. Future work must test boundary conditions for the spontaneous detection of norms, by using a processing goal that does not involve norm-violation detection (e.g. a judgment of whether the behavior typically occurs outside or inside). Moreover, how specific the reported effects may be to norm violations must be further investigated. Fourth, our work focused primarily on conventional norms. As such, our findings may or may not generalize to violations of moral values and imperatives. Future work must explore neural responses to moral (*vs* conventional) violations.

Finally, it would be important to extend the current paradigm to the priming of other goals—most importantly, goals of independence. At first glance, goals for independence might seem to suppress social norms (resulting in a less pronounced norm-violation N400) since this suppression could be an effective means to promote freedom from social norms. However, as argued by Erich Fromm (1941), a psychoanalyst, such goals may paradoxically make the existing norms more salient (thereby augmenting the N400 in the context of the current experimental paradigm). More specifically, under certain conditions, some facets of independence (e.g. freedom and separation from others) could induce a fear of anomie, lawlessness or what Fromm called the hopelessness. If so, the priming of independence might motivate some individuals to 'escape from freedom' (Fromm, 1941), thereby increasing their norm sensitivity under such conditions. Only future work can tell whether this hypothesis might have any merit in the sociocultural neuroscience of social norms.

Supplementary data

Supplementary data are available at *SCAN* online.

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Conflict of interest

The authors declare no conflicts of interest.

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