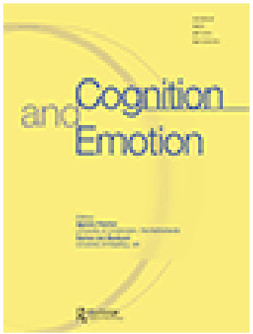

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BRIEF ARTICLE

Culture impacts the magnitude of the emotion-induced memory trade-off effect

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ABSTRACT

The present study assessed the extent to which culture impacts the emotion-induced memory trade-off effect. This trade-off effect occurs because emotional items are better remembered than neutral ones, but this advantage comes at the expense of memory for backgrounds such that neutral backgrounds are remembered worse when they occurred with an emotional item than with a neutral one. Cultures differ in their prioritisation of focal object versus contextual background information, with Westerners focusing more on objects and Easterners focusing more on backgrounds. Americans, a Western culture, and Turks, an Eastern-influenced culture, incidentally encoded positive, negative, and neutral items placed against neutral backgrounds, and then completed a surprise memory test with the items and backgrounds tested separately. Results revealed a reduced trade-off for Turks compared to Americans. Although both groups exhibited an emotional enhancement in item memory, Turks did not show a decrement in memory for backgrounds that had been paired with emotional items. These findings complement prior ones showing reductions in trade-off effects as a result of task instructions. Here, we suggest that a contextual-focus at the level of culture can mitigate trade-off effects in emotional memory.

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Culture; cognition; memory; emotion; trade-off

Emotional objects can detract from remembering neutral peripheral information, an effect known as the emotion-induced memory trade-off effect (e.g. Kensinger, 2007). To date, studies of this effect have relied on Western populations. We predict that culture could impact emotional memory, on the basis of previously demonstrated cultural differences in attention to central objects versus background information (e.g. Nisbett & Masuda, 2003). Specifically, cultures that prioritise context should exhibit a reduced emotion-induced trade-off effect, such that emotional objects would not be preferentially remembered at the expense of the peripheral background information, compared to object-focused cultures. In the present study, we examine whether culture impacts the magnitude of the emotion trade-off effect in memory by comparing Easterners, thought to prioritise context, with Westerners, thought to prioritise objects.

Differences in object versus background processing are one of the most pervasive findings in the cross-cultural literature. In an initial study, Masuda and Nisbett (2001) investigated Japanese and American participants' perception of animated vignettes composed of focal objects placed against a background (e.g. an underwater scene with fish swimming past seaweed). The descriptions of these vignettes differed across cultures, with Japanese mentioning context and relationships more often than Americans. During a memory test of the focal object, the background was preserved, removed, or changed. For Americans, memory for the objects was unaffected by the manipulation of backgrounds. Japanese participants, however, were sensitive to changes in the background such that memory performance for the objects was poorest when tested against an altered background. Masuda and Nisbett (2001) concluded that Westerners attend more to focal objects and

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less to context whereas East Asians are more sensitive to context, encountering more difficulty separating an object from its background. Differences in attending to objects versus contexts could result from a number of different forces that shape cultures, including social (e.g. complex roles and a focus on interdependence in Eastern societies), intellectual (e.g. systems of logic), and physical (e.g. more object-rich environments in the East) factors (Nisbett & Masuda, 2003).

A number of studies with a range of tasks (e.g. Kitayama, Duffy, Kawamura, & Larsen, 2003; Nisbett, Peng, Choi, & Norenzayan, 2001) and multiple methods converge to substantiate the difference across cultures in object and background processing. Eye tracking studies reveal differences in viewing patterns across cultures. When freely viewing pictures comprised of an object against a background, American participants fixated to focal objects quicker and longer than Chinese participants, who saccaded to the background more often than Americans (Chua, Boland, & Nisbett, 2005; but see Evans, Rotello, Li, & Rayner, 2009). In another eye tracking study employing changes in scenes, Americans' fixations to objects were more affected by the object change than were those of Chinese participants (Goh, Tan, & Park, 2009). Americans' eye movements were generally constrained to the focal object, in contrast to the Chinese, who had shorter overall fixations to both objects and backgrounds. Additionally, fMRI studies have revealed cultural differences related to object and background processing. When viewing complex scenes, Americans activate more regions of the brain associated with object processing than do East Asians (Gutchess, Welsh, Boduroğlu, & Park, 2006). Americans also show a stronger adaptation response (i.e. reduced neural response) to repeated objects across quartets of pictures than Singaporeans, whereas there is no difference across cultures in the response to backgrounds or object-context binding. The cultural difference is most evident for older adults, with older Singaporeans evincing less adaptation than older Americans (Goh et al., 2007).

Cultural differences in attending to objects versus backgrounds could impact emotional processing. Few studies have addressed this; one that did found a pattern similar to that of cross-cultural studies of nonemotional stimuli. Stimuli consisted of cartoon characters, with one central character in front of other background characters' faces who could be exhibiting emotion congruent or incongruent with that of the central face (Masuda et al., 2008). Japanese were more sensitive than Americans to the facial expressions of the background characters, such that the perception of the emotion on the central character was affected by the emotion displayed by the background characters. Memory for the central character was similar across the two groups, but Japanese performed better at recognising changes in the facial expressions of the background characters, compared to Americans. Two other studies with emotional stimuli converged with the pattern of greater sensitivity to background information for East Asians. One employed photos of faces rather than cartoons, finding that contextual faces impaired recognition of the emotional expression of a central face to a greater extent for Chinese than Americans (Stanley, Zhang, Fung, & Isaacowitz, 2013). Another showed that Korean young adults performed better than Americans at recognising background scenes when presented behind faces exhibiting emotional expressions (Ko, Lee, Yoon, Kwon, & Mather, 2011).

The present study employs the emotion-induced memory trade-off effect (reviewed by Kensinger, 2007) to test whether cultural differences in object and backgound processing extend to memory for emotional information. In this paradigm, a focal target item that is emotionally positive, negative, or neutral is depicted against a neutral background. In addition to finding the typical enhancement in memory for emotional information, such that positive and negative items are remembered better than neutral ones, remembering emotional items detracts from memory for backgrounds. This results in a trade-off, such that neutral backgrounds that had been paired with positive or negative items are not remembered as well as those neutral backgrounds that had been paired with neutral items. Such effects have been reported in a number of studies (e.g. Kensinger, Piguet, Krendl, & Corkin, 2005; Waring, Payne, Schacter, & Kensinger, 2010), including younger and older adults (e.g. Kensinger, Gutchess, & Schacter, 2007; Waring & Kensinger, 2009) and trauma-exposed individuals with and without PTSD (e.g. Mickley Steinmetz, Scott, Smith, & Kensinger, 2012). However, the emotion-induced memory trade-off effect thus far has been investigated exclusively with Westerners; this study is the first direct comparison across international samples.

We predict that individuals from Eastern cultures might exhibit a reduced emotion-induced memory trade-off effect, given the prioritisation of background

and context in information processing. Thus, background memory may be less impaired by the presence of an emotional item at encoding for Easterners compared to Westerners. It is also possible that a context focus could reduce the emotionality of the objects. We compared Americans' memory for emotional items and backgrounds, consistent with prior research illustrating trade-offs in this population (e.g. Kensinger et al., 2005; Waring et al., 2010), with the performance of Turks, as a culture representing a blend of Eastern and Western influences. Like East Asian cultures, Turkish culture is more collectivist or interdependent than American culture (Imamoğlu & Karakitapoğlu-Aygün, 2007). Prior research has demonstrated cognitive differences between Turks and Americans that parallel differences identified for East Asians and Americans (e.g. Schwartz, Boduroglu, & Gutchess, 2014).

Methods

Participants

45 American students recruited at Brandeis University, Waltham, USA, and 41 Turkish students recruited at Bogazici University, Istanbul, Turkey participated in the study. Additional data were excluded a priori from participants with ethnicity, language or birthplace inconsistent with their samples (US = 9, Turkey = 1), unusable data (e.g. below chance performance; missing files) (US = 6, Turkey = 4), or administration error (Turkey = 15). Target sample size was set a priori at 40, based on power calculations from prior work (Kensinger et al., 2007; Schwartz et al., 2014). Participants were native to their respective country, had lived the majority of their lives there, and were tested in their native language. All provided written consent in accordance with the Brandeis IRB and the Bogazici Ethics Committee. We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study.

Materials

Stimuli consisted of visual scenes created by placing positive, negative, or neutral items onto neutral background scenes. All objects and backgrounds in the stimulus set were used in prior studies (e.g. Waring & Kensinger, 2009). Past studies controlled the size and approximate location of the positive, negative, and neutral items in comparison to the background, and matched scenes for other details including visual complexity, congruency between item and background, and the number of people, animals, and buildings.

Items consisted of 180 nameable photographic images, consisting of 60 each of positive (e.g. a dog standing in a park), negative (e.g. a skull placed in a desert), and neutral images (e.g. a bicycle parked in front of a building). Stimuli were randomised into two study lists with 90 scenes each (30 negative, 30 positive, and 30 neutral). Lists were counterbalanced across participants such that one list was presented at study and the other was used for the new stimuli presented at recognition.

During the recognition memory task, the items and backgrounds from both study lists were separated from each other, such that memory was assessed separately for items (presented on a white background) and backgrounds. Based on the study list participants viewed, "old" (i.e. previously seen items) or "new" items were counterbalanced across participants.

The Relational, Individual, and Collective Self-Aspects (RIC) Scale (Kashima & Hardie, 2000) and the Self Construal Scale (SCS) (Singelis, 1994) assess cultural values related to self-construal (e.g. does one see the self as an independent entity or as interdependent, in relation to others). These scales are commonly used in the culture literature, and we included them to characterise our samples (but see Na et al., 2010) and for comparison with other samples in the literature.

The Operation Span Test (Unsworth, Heitz, Schrock, & Engle, 2005) measures working memory and executive function and is used to ensure that cultural samples are equated on cognitive ability. In this computerised task, participants solved mathematical problems while attempting to remember a set of unrelated words. If a subject scored less than 85% for the operations, the subject was excluded, as they were not properly prioritising the math task and potentially reducing the dual-task requirements.

Procedure

Participants incidentally encoded pictures by rating them on emotional intensity. During this session, participants were shown 90 scenes that consisted of 30 positive, 30 neutral, and 30 negative objects on neutral backgrounds. Participants were asked to rate them according to emotional intensity on a scale of 1–9 with 1 being intensely negative, 5 being neutral, and 9 being intensely positive. Each scene was shown for 5 s on a white computer screen, in a

randomised order for each participant. Participants were asked to make their rating of emotional intensity within these five seconds. All participants completed a practice session before completing the encoding task.

After the encoding task, participants completed cognitive tasks, including Operation Span and a demographics questionnaire. If the participant finished before the 20 min retention delay and wished to continue rather than taking a break, they completed the RIC and SCS scales. Otherwise these measures were administered at the end of the session.

The surprise recognition task was administered after the 20-minute retention period. Participants viewed 90 items (30 positive, 30 negative, and 30 neutral) and 90 backgrounds (all neutral). The components of the images were separated from each other and tested individually (e.g. the item, a dog, tested separate from memory for the park). They also viewed 90 new items (30 of each valence type) and 90 new neutral backgrounds, which were all shown isolated from each other and presented in a random order, unique to each participant. For each item or background, participants were asked to indicate whether they believed the picture was new or old (i.e. had been seen previously in the encoding task). Upon completion, participants were fully debriefed.

Results

Participant demographics and cognitive test scores

Demographics and cognitive data are presented in Table 1. The Turkish group is older than the American group, $t(76) = 3.08$, $p < .004$,[1] reflecting an additional year of language instruction before enrolling at Bogazici. Despite a group difference on the dot comparison task, a measure of speed of processing, $t(81) = 2.42$, $p < .02$, the groups were well matched on working memory and executive function, as evidenced by the operation span scores. The groups endorse similar values on the SCS and RIC scales, with only relational self differing across cultures, $t(82) = 4.07$, $p < .001$.

Valence ratings

The encoding judgments of emotional intensity were compared across 45 Americans and 38 Turks (ratings were unavailable from three participants) in a 2×3 mixed ANOVA with culture (American or Turkish) as the between-subjects variable and emotional valence of the picture (positive, neutral, or negative) as the within subject variable. The pattern of means and standard deviations are presented in the bottom panel of Table 1. Results revealed a significant main effect of emotional valence, $F(2, 162) = 296.05$, $p < .001$, $\eta_p^2 = .79$. Follow-up t-tests substantiated that emotional images, both negative, $t(82) = 16.67$, $p < .001$, and positive, $t(82) = 8.94$, $p < .001$, were indeed rated more extremely (i.e. further from the midpoint) than neutral images, and negative images were rated lower than positive images, $t(82) = 20.49$, $p < .001$. There was also a significant main effect of culture, with Americans' ratings ($M = 5.24$, SD = .54), higher (e.g. more towards the positive end of the scale) than Turks' ratings ($M = 4.64$, SD = .54). The interaction of culture × valence did not approach significance, $F(2, 162) = 1.76$, $p = .18$, $\eta_p^2 = .02$.

Emotion-Induced memory trade-off effect

The emotion-induced memory trade-off effect, as defined by Waring and Kensinger (2009), is the increase in memory for emotional items, in comparison to neutral items, and the decrease in memory for neutral backgrounds paired with emotional items, compared to those paired with neutral items. Corrected memory scores were computed by subtracting the number of false alarms (i.e. new picture element incorrectly recognised as old) from the proportion of hits (i.e. new picture element correctly recognised as old). These scores were calculated separately for each image (object or background) based on its emotional valence (positive, negative, or neutral). The averages for each condition, separated by culture, are presented in Figure 1.

Following the calculation of corrected memory scores, a $2 \times 2 \times 3$ ANOVA was conducted to test the effect of culture (American or Turkish) on memory for an image type (item or background) as an effect of emotional valence (positive, neutral, or negative). The ANOVA revealed a significant main effect for image type, $F(1, 84) = 110.88$, $p < .001$, $\eta_p^2 = .57$ with memory for items ($M = .52$, SD = .16) better than memory for backgrounds ($M = .38$, SD = .15). There was also a marginal effect for valence, $F(2, 168) = 2.50$, $p = .085$, $\eta_p^2 = .03$. In line with the expectation for trade-off effects, there was a significant interaction between valence and image type, $F(2, 168) = 21.12$, $p < .001$, $\eta_p^2 = .20$. Our data were in line with previous studies of the trade-off effect in that the memory

Table 1. Demographic information and means for ratings during encoding (with standard deviations) for participants from each culture.

	US	Turkey	Significance
N	45	41	
Age	19.77 (1.05)	20.53 (1.11)	$p < .004$*
Gender (M/F)	16/28/(1 unknown)	14/27	
Dot Comparison	16.45 (3.49)	14.81 (2.56)	$p < .02$*
Operation Span Score	50.47 (15.76)	50.85 (12.74)	$p = .90$
RIC – Individual Self	60.64 (5.58)	58.85 (5.89)	$p = .16$
RIC – Relational Self	61.86 (5.35)	56.95 (5.72)	$p < .001$*
RIC – Collective Self	55.84 (8.60)	57.29 (7.84)	$p = .42$
SCS – Independence	4.82 (.81)	4.98 (.69)	$p = .33$
SCS – Interdependence	4.90 (.58)	4.74 (.73)	$p = .28$
Rating of Negative Images	4.09 (.50)	3.66 (.70)	
Rating of Neutral Images	5.51 (.65)	4.86 (.71)	
Rating of Positive Images	6.11 (.64)	5.40 (.86)	

Ratings of images were on a 9-point scale, with 1 = intensely negative and 9 = intensely positive.
*Denotes a statistically significant difference between Americans and Turks. See text for description of tasks.

advantage for items over backgrounds tended to be larger for emotional stimuli than for neutral stimuli. This pattern was substantiated by follow-up 2×2 ANOVAs between two levels of emotion and image type. For the ANOVA including negative and neutral stimuli, the interaction between valence and image type (item or background) was significant, $F(1, 84) = 6.18$, $p < .02$, $\eta_p^2 = .07$, whereas the interaction between valence and image type was only marginally significant for the ANOVA including positive and neutral stimuli, $F(1, 84) = 3.58$, $p = .06$, $\eta_p^2 = .04$.

In terms of the effects of culture, the critical test for the interaction of Culture × Image Type × Valence was significant, $F(2, 168) = 3.45$, $p < .04$, $\eta_p^2 = .04$. Figure 1 shows that whereas both groups appear to better remember emotional items than neutral items, Americans tend to have impaired memory for backgrounds presented with emotional items, compared to those presented with neutral backgrounds. In contrast, Turks appear to have more consistent memory for backgrounds across conditions. To substantiate the nature of this interaction, 2×3 ANOVAs of culture (US, Turkey) and valence (Positive, Negative, and Neutral) were conducted on memory performance for the backgrounds alone as well as for the items alone. This analysis revealed a significant Culture × Valence interaction for the background stimuli, $F(2, 168) = 3.25$, $p < .05$, $\eta_p^2 = .04$, such that the effects of valence were larger for Americans than Turks. In contrast, the interaction of Culture × Valence did not approach significance for the items, $F(2, 168) = .60$, $p = .55$, $\eta_p^2 = .01$. Finally, the main effect of culture was also significant, $F(1, 84) = 8.12$, $p < .01$, $\eta_p^2 = .09$, with Americans ($M = .49$, $SD = .14$) exhibiting higher levels of memory overall than Turks ($M = .41$, $SD = .14$). No other effects approached significance.

To present the results in a manner consistent with some prior studies (e.g. Mickley Steinmetz et al., 2012; Waring et al., 2010), we also calculated trade-off scores. Separate positive and negative trade-off scores were computed by subtracting the corrected memory scores for backgrounds from the corrected scores for items. The formula used was: (corrected memory score for emotional item – corrected memory score for neutral item) – (corrected memory score for background paired with emotional item – corrected memory score for background paired with neutral item). With this formula, the largest trade-off score occurs when there is better memory for emotional items, in comparison to neutral items, and poorer memory for the backgrounds paired with emotional items, compared to backgrounds paired with neutral items. A 2×2 ANOVA with Culture (American/Turkish) as a between-participants variable and Valence (Positive/Negative) as a within-participant variable revealed a main effect of Culture such that Americans' Positive ($M = .17$, $SD = .19$) and Negative ($M = .15$, $SD = .20$) trade-off scores were higher than Turks' (Positive: $M = .09$, $SD = .19$; Negative: $M = .05$, $SD = .18$). No other effects approached significance.

Discussion

In a comparison of Western (American) and Eastern (Turkish) cultures, Turks exhibited a reduced trade-off effect in emotional memory. Americans exhibited the typical pattern of trade-off effects, with increased memory for emotional items, compared to neutral ones, as well as reduced levels of memory for

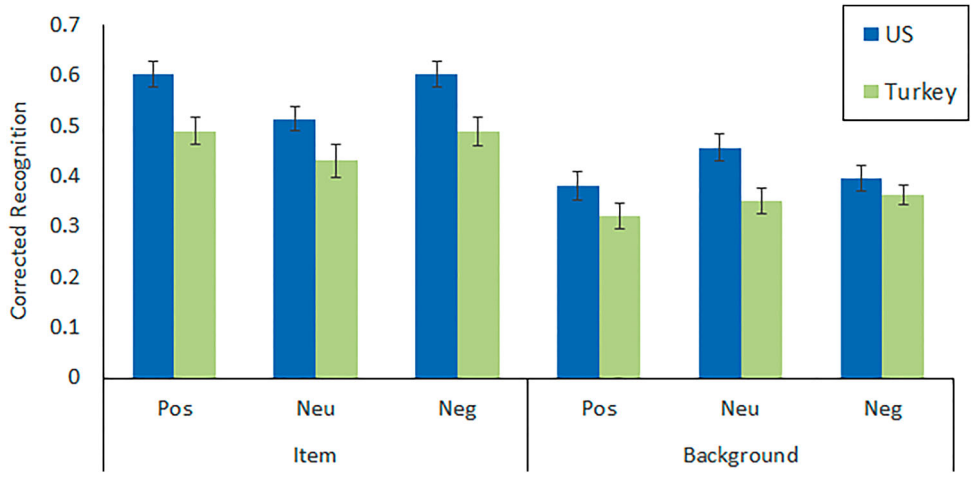

Figure 1. Memory performance.

backgrounds that had been paired with emotional items, compared to those that had been paired with neutral items. In contrast, Turks showed an emotional enhancement in item memory, but did not exhibit a decrement in memory for backgrounds. As discussed in Waring and Kensinger (2009), these contrasting effects of emotion on memory for items and their associated backgrounds in combination account for the trade-off effect.

This pattern of results indicates that cultures that attend to backgrounds may be less prone to emotional trade-off effects. Despite the enhanced memory for emotional objects, which occurred across cultures, Turks' memory for backgrounds was unaffected by the presence of emotional, as opposed to neutral, objects at encoding. The findings are consistent with what would be expected for cultures that emphasise contextual processing in that background memory is preserved. Interestingly, the reduced trade-off effect in Turks suggests that the potential for emotion to narrow attention, thus leading to focus on the central information at the expense of peripheral information (Easterbrook, 1959), could be mitigated by a contextual focus. Whether contextual and emotional information compete for resources or resources are expanded as an effect of a lifetime of experience of attending broadly to contextual information remains to be uncovered in future work. However, our findings could be analogous to previous results showing that instructions and task orientation could eliminate the trade-off effect. For example, intentionally or elaboratively encoding images repaired memory for emotional backgrounds such that they reached the level of memory for neutral backgrounds for young adults, and telling a story or answering questions about the object and background reduced the trade-off effect (Kensinger et al., 2005; Kensinger et al., 2007). Whether culture selectively effects consolidation of specific elements of the picture would be of interest for future work. Previous studies have shown that the retention interval can impact the nature of the trade-off effects (Waring & Kensinger, 2009). Whether longer delays would enhance the trade-off similarly for both cultures or exaggerate cultural differences as a function of emotion would provide a window into how culture affects post-encoding processes. Cross-cultural research thus far has included little research systematically comparing the effects on different stages of memory and consolidation processes.

Individual differences including anxiety, executive function, and visuospatial working memory also impact the magnitude of trade-off effects (Waring et al., 2010). Although we would be more willing to attribute our group differences to strategic or attentional effects related to contextual focus, it is possible that our findings could reflect more stable group differences. Our groups were matched on operation span, a measure of executive function, but they were not matched on anxiety. Prior work suggests that stress could impact cultural patterns. Context influenced young Koreans' ratings of target faces less for those who reported higher levels of stress, possibly

reflecting a narrowed attentional focus (Ko et al., 2011). It is also possible that levels of independence or interdependence could reflect context-focus, and thus be related to the magnitude of trade-off effects (e.g. reduced trade-off effects for highly interdependent individuals). However, in our study, the pattern of means on these measures is not in-line with expected cross-cultural differences. The failure to find a relationship between these variables and culture-level effects may reflect the considerable variability in national samples in self-construal, such as independence and interdependence, and the challenges of equating cultural differences with individual level differences (Na et al., 2010). Future studies illustrating ways of expanding or eliminating cultural differences in trade-off effects will be important to identify the mechanisms through which culture operates, and how individual differences in emotion, self-construal, culture-level effects, and cognitive processes influence each other.

Alternatively, perceiving stimuli as less emotional could reduce the necessity of focusing on central information at the expense of context information. Our failure to identify cultural differences in the patterns of ratings across the three emotion types argues against this explanation; the fact that stimuli were rated with emotional objects in the neutral contexts also addresses the possibility that the emotionality of an item is reduced when placed in a neutral backgrounds, for those individuals who prioritise the processing of emotional information. However, it is difficult to rely on ratings across cultures, as scale usage could differ (e.g. Chen, Lee, & Stevenson, 1995) or interpretation or preference for different emotional states could influence ratings. For example, Easterners prefer low arousal positive emotional states (e.g. calm) whereas Westerners prefer high arousal positive emotional states (e.g. excited) (Tsai, Miao, Seppala, Fung, & Yeung, 2007). These preferences could induce differences in how rating scales are used. Furthermore, we did not assess ratings of emotional arousal per se, which previous work has shown influences the magnitude of the trade-off effects (Waring & Kensinger, 2009).

Converging results suggest that differences in emotional processing or ratings across cultures do not heavily influence the trade-off effect (Mickley Steinmetz, Sturkie, Rochester, Liu, & Gutchess, under review). Using a hierarchical linear modelling approach allowed for ratings of emotional intensity, for each individual and each image, to be accounted for in the model. Cultural differences did not emerge as an effect of ratings of emotionality. One surprising outcome of the study, however, was that American and East Asian participants did not differ in the trade-off effect. Although we would have predicted that cross-cultural differences in the trade-off effect would extend to comparisons of East Asians and Americans, it is possible that some of the specific aspects of the study prevented this from occurring. For example, East Asian participants were tested in the US; it is possible that students from East Asia who elect to attend college in the US are more independent or otherwise differ from those who could be sampled from East Asian countries. Other design aspects, such as the incorporating high and low arousal images and same and similar stimuli (e.g. two different pictures of snakes) to assess memory specificity, could also contribute to the differences in findings across studies.

In conclusion, the present results suggest that the magnitude of the emotion-induced memory trade-off effect can differ across cultures, perhaps reflecting cross-cultural differences in prioritisation of objects versus contexts. This result contributes to a small literature on the impact of culture on emotional memory, suggesting that the intersection of cognition and emotion may be a rich one for further investigation across cultures. This area of study seems particularly fruitful given the evidence for malleability in the trade-offs and content of information that can be retrieved accurately across cultures.

Note

1. Note that different degrees of freedom reflect missing participant data.

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Disclosure statement

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References

Chen, C., Lee, S. Y., & Stevenson, H. W. (1995). Response style and cross-cultural comparisons of rating-scales among East Asian and North American students. *Psychological Science*, *6*, 170–175.

Chua, H. F., Boland, J. E., & Nisbett, R. E. (2005). From the cover: Cultural variation in eye movements during scene perception. *Proceedings of the National Academy of Sciences*, *102*(35), 12629–12633.

Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, *66*, 183–201.

Evans, K., Rotello, C. M., Li, X., & Rayner, K. (2009). Scene perception and memory revealed by eye movements and receiver-operating characteristic analyses: Does a cultural difference truly exist? *The Quarterly Journal of Experimental Psychology*, *62*, 276–285.

Goh, J. O., Chee, M. W., Tan, J. C., Venkatraman, V., Hebrank, A., Leshikar, E. D., … Park, D. C. (2007). Age and culture modulate object processing and object-scene binding in the ventral visual area. *Cognitive, Affective, & Behavioral Neuroscience*, *7*(1), 44–52.

Goh, J. O., Tan, J. C., & Park, D. C. (2009). Culture modulates eye-movements to visual novelty. *PLoS ONE*, *4*(12), e8238.

Gutchess, A. H., Welsh, R. C., Boduroğlu, A., & Park, D. C. (2006). Cultural differences in neural function associated with object processing. *Cognitive, Affective, & Behavioral Neuroscience*, *6*(2), 102–109.

Imamoğlu, E. O., & Karakitapoğlu-Aygün, Z. (2007). Relatedness of identities and emotional closeness with parents across and within cultures. *Asian Journal of Social Psychology*, *10*(3), 145–161.

Kashima, E. S., & Hardie, E. A. (2000). The development and validation of the relational, individual, and collective self-aspects (RIC) scale. *Asian Journal of Social Psychology*, *3*(1), 19–48.

Kensinger, E. A. (2007). Negative emotion enhances memory accuracy: Behavioral and neuroimaging evidence. *Current Directions in Psychological Science*, *16*(4), 213–218.

Kensinger, E. A., Gutchess, A. H., & Schacter, D. L. (2007). Effects of aging and encoding instructions on emotion-induced memory trade-offs. *Psychology and Aging*, *22*(4), 781–795.

Kensinger, E. A., Piguet, O., Krendl, A. C., & Corkin, S. (2005). Memory for contextual details: Effects of emotion and aging. *Psychology and Aging*, *20*, 241–250.

Kitayama, S., Duffy, S., Kawamura, T., & Larsen, J. T. (2003). Perceiving an object and its context in different cultures: A cultural look at new look. *Psychological Science*, *14*(3), 201–206.

Ko, S. G., Lee, T. H., Yoon, H. Y., Kwon, J. H., & Mather, M. (2011). How does context affect assessments of facial emotion? The role of culture and age. *Psychology and Aging*, *26*, 48–59.

Masuda, T., Ellsworth, P. C., Mesquita, B., Leu, J., Tanida, S., & Van de Veerdonk, E. (2008). Placing the face in context: Cultural differences in the perception of facial emotion. *Journal of Personality and Social Psychology*, *94*, 365–381.

Masuda, T., & Nisbett, R. E. (2001). Attending holistically versus analytically: Comparing the context sensitivity of Japanese and Americans. *Journal of Personality and Social Psychology*, *81*(5), 922–934. doi:10.1037/0022-3514.81.5.922

Mickley Steinmetz, K. R., Scott, L. A., Smith, D., & Kensinger, E. A. (2012). The effects of trauma exposure and posttraumatic stress disorder (PTSD) on the emotion-induced memory trade-off. *Frontiers in Integrative Neuroscience*, *6*. doi:10.3389/fnint.2012.00034

Mickley Steinmetz, K. R., Sturkie, C. M., Rochester, N. M., Liu, X., & Gutchess, A. H. (under review). Cross cultural differences in item and background memory: Examining the influence of emotional intensity and scene congruency.

Na, J., Grossmann, I., Varnum, M. E. W., Kitayama, S., Gonzalez, R., & Nisbett, R. E. (2010). Cultural differences are not always reducible to individual differences. *Proceedings of the National Academy of Sciences*, *107*, 6192–6197.

Nisbett, R. E., & Masuda, T. (2003). Culture and point of view. *Proceedings of the National Academy of Sciences*, *100*, 11163–11170.

Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review*, *108*, 291–310.

Schwartz, A. J., Boduroglu, A., & Gutchess, A. H. (2014). Cross-cultural differences in categorical memory errors. *Cognitive Science*, *38*, 997–1007.

Singelis, T. M. (1994). The measurement of independent and interdependent self-construals. *Personality and Social Psychology Bulletin*, *20*(5), 580–591.

Stanley, J. T., Zhang, X., Fung, H. H., & Isaacowitz, D. M. (2013). Cultural differences in gaze and emotion recognition: Americans contrast more than Chinese. *Emotion*, *13*, 36–46.

Tsai, J. L., Miao, F. F., Seppala, E., Fung, H. H., & Yeung, D. Y. (2007). Influence and adjustment goals: Sources of cultural differences in ideal affect. *Journal of Personality and Social Psychology*, *92*(6), 1102–1117.

Unsworth, N., Heitz, R. P., Schrock, J. C., & Engle, R. W. (2005). An automated version of the operation span task. *Behavior Research Methods*, *37*, 498–505.

Waring, J. D., & Kensinger, E. A. (2009). Effects of emotional valence and arousal upon memory trade-offs with aging. *Psychology and Aging*, *24*(2), 412–422.

Waring, J. D., Payne, J. D., Schacter, D. L., & Kensinger, E. A. (2010). Impact of individual differences upon emotion-induced memory trade-offs. *Cognition and Emotion*, *24*(1), 150–167. doi:10.1080/02699930802618918