

Use of self-referencing memory strategies change over time with acculturation

Ashley N. Gilliam^{*}, Angela Gutchess

Brandeis University, Waltham, MA, USA

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ABSTRACT

Although cross-cultural research identifies cognitive differences when comparing across individuals, few studies have examined how acculturation, or cultural change over time within individuals, affects cognition. To address this gap, we investigated how acculturation and change in self-construal for Chinese students in the US impacts the self-reference effect in memory over two timepoints. Participants completed a self-referencing memory task and a set of questionnaires assessing acculturation orientation and self-construal over two time points, on average 16 months apart. As individuals' orientation towards host culture and independence increased over the two time points, they exhibited a larger self-reference effect (self vs. other) in memory and a smaller other-reference (other vs. control) effect. These patterns indicated that as Chinese students became more acculturated to US culture, they exhibited more US-like patterns of behavior in memory. In contrast, between-participant variability in acculturation orientation and independence were not related to self- or other-referencing.

Cognitive strategies and information processing styles vary across cultures (Han et al., 2013; Ji, Peng, & Nisbett, 2000; Kitayama, Duffy, Kawamura, & Larsen, 2003; Masuda & Nisbett, 2001; Wang & Conway, 2004). However, past cross-cultural cognitive research has typically compared Easterners and Westerners without considering change in individuals or the effects of exposure to new cultures. With increased globalization and cross-cultural interaction, understanding how cultural exposure and change influence cognition is crucial. Acculturation, culture change in individuals through continuous contact between distinct cultural groups, allows one to investigate within-person cultural differences while measuring potential explanatory factors, rather than comparing distinct groups that may differ in various ways. To address this gap in the literature, our study explores how acculturation and change in self-related cultural values impact the use of self-referencing memory strategies among Chinese students as they acculturate to the US over time.

The self-reference effect refers to a pattern wherein information related to oneself is remembered better than information related to others, even close others like a mother (Gutchess, Kensinger, Yoon, & Schacter, 2007; Klein & Kihlstrom, 1986; Symons & Johnson, 1997; Rogers, Kuiper, & Kirker, 1977). This effect is less pronounced in East Asian cultures, for which memory benefits from self-referencing are reduced compared to Western cultures (Ng & Lai, 2009; Sui, Zhu, &

Chiu, 2007; Wagar & Cohen, 2003; Zhang et al., 2020; Zhu, Zhang, Fan, & Han, 2007). This difference is thought to reflect the independent self-construal of Westerners, focused on one's own needs, and the interdependent self-construal of Easterners, focused on one's relationships with others (Markus & Kitayama, 1991; Singelis, 1994). This work provides evidence for reduced distinctions between self and close other for East Asians as compared to North Americans. For example, Asian-Canadians take longer than Euro-Canadians to recognize traits associated with the self as compared to those associated with a best friend (Wagar & Cohen, 2003). Although most research on this cognitive strategy has focused on the reduced benefits for self memory for East Asians compared to Westerners, some work suggests that for Chinese participants, thinking about one's mother is just as effective of a memory strategy as thinking about oneself (Sui et al., 2007; Zhu et al., 2007). This suggests that close other memory can be enhanced for some East Asians relative to Westerners. To better understand these memory strategy differences, they need to be explored using more nuanced contrasts. The current study will do so by examining the *self-reference effect* (comparing self and close other memory conditions) alongside the *other-reference effect* (comparing close other and control memory conditions).

Previous research has largely examined cultural effects on self-referencing in memory at the group level, at one time point (e.g., Wagar & Cohen, 2003; Zhang, Hung, Jackson, Tai, Goh, & Gutchess,

^{*} Corresponding author at: Dept. of Psychology, 415 South St., Waltham, MA 02543, USA.

E-mail address: ashleygilliam@brandeis.edu (A.N. Gilliam).

2019; Zhu et al., 2007). Our previous study (Gilliam and Gutches, 2024) extended research by investigating variation between individuals who had recently relocated to the US from China. However, measures of acculturation or self-construal were not related to the level of self-referencing or other-referencing in memory at one time point. By measuring change in acculturation and self-construal over time, one can gain more sensitivity and precision to detect relationships among these factors.

There are many processes associated with acculturation, spanning language use and proficiency, media use, social-interaction, identity, and values; these processes may also vary depending on if they are evaluated in public versus private contexts (Arends-Tóth & Van de Vijver, 2004; Berry, 1992; Matsudaira, 2006; Redfield, Linton, & Herskovits, 1936; Schrauf, 2002). A major focus for our study was change in self-concept with immigration and cultural contact (Liebkind, 2006), suggesting that exposure to and experiences in the West may alter memory patterns for Easterners. Results of group comparisons at one time point have been interpreted to suggest that exposure to differing perspectives may influence cognition. For example, younger adults may exhibit less culturally traditional memory patterns (i.e., young adult East Asians demonstrating more Western memory patterns; Zhang et al., 2020) compared to older adults, possibly due to increased engagement with Western media and thought patterns. However, direct measures to confirm this interpretation are lacking, and there are many alternative explanations to account for why cultural effects could vary across age groups, including unrelated cohort effects.

Research with bicultural individuals, who can hold multiple cultural identities and perspectives, is one approach to examine multiple identities. Using priming, these studies bring to consciousness one cultural identity or another (e.g., for a Chinese American, their Chinese or American identity), demonstrating that bicultural individuals can switch frames of mind based on the cultural context that is primed through the presentation of cultural icons (e.g., Great Wall of China; Disneyland; Benet-Martínez, Leu, Lee, & Morris, 2002; Hong, Morris, Chiu, & Benet-Martínez, 2000) or the language used for the task (e.g., Wang & Ross, 2005; Wang, Shao, & Li, 2010). Some bicultural studies have shown that variation in level of acculturation can impact autobiographical memory patterns when comparing individuals on more indirect measures (age of immigration, immigrant vs non-immigrant coding; Wang, Song, & Kim Koh, 2017; Wang, 2013). Research also shows that more direct measures of acculturation (host and heritage culture affiliation) vary with context and priming (Lechuga, 2008), and that bicultural parents may socialize their children to acquire multiple cultural identities and perspectives (Wang, Koh and Song, 2015). Together, these findings exemplify the contextual malleability of cultural perspectives and cognitive strategies in individuals who have already acquired multiple cultural identities.

Although research has begun to probe the ways in which macro-level cultures can change over time (Varnum & Grossmann, 2017), less research has focused on within-person change over time, particularly in terms of the effects on cognition. Previous social and self-related cognitive research suggests that acculturation is a dynamic process. Acculturation, like much research on culture more generally, is usually studied at one time point between subjects. However, some researchers argue it should be studied across time within-subjects (Murray et al., 2014; Schrauf, 2002). Previous work has identified variation in relationships between acculturation and health behaviors (i.e., identification with Asian and US culture and alcohol consumption) longitudinally that were not apparent through comparisons across subjects at one time point (Murray et al., 2014). Similarly, others have demonstrated neural divergence over time among immigrants who change in self-construal to become “less like Easterners” or “more like Easterners” (Chen, Wagner, Kelley, & Heatherton, 2015). This demonstrates the importance of measuring acculturation and its impact on outcomes of interest over time.

In the present study we extended past research by explicitly

examining how change in one aspect of acculturative experience, orientation towards host relative to home culture, impacts mnemonic strategy benefits in memory. Acculturation orientation captures one's desire to engage with host and home culture friends, traditions, characteristics, and habits, making it a richer and more direct measure than previous metrics (e.g., length of time since immigration, age of immigration). As in our prior study (Gilliam and Gutches, 2024), we use a continuous measure of acculturation orientation in order to maximize power as this is the first study to examine the impact of acculturation on self-referencing in memory over time. However, we were influenced by Berry's (1992) model that often categorizes individuals into various forms of acculturation styles (e.g., integration, assimilation, marginalization, separation). It should also be noted that there are many other aspects and measures of acculturation (e.g., language use, media usage) that were not feasible to include in this initial study. Additionally, we examined the impact of self-construal on memory patterns over time, given its suggested role in cultural and self-referencing effects (Huff, Yoon, Lee, Mandadi, & Gutches, 2013; Sui et al., 2007; Wagar & Cohen, 2003).

1. Predictions

We hypothesized that acculturation orientation (i.e., one's affiliation to their native home culture versus their new host culture) and cultural values, specifically independent versus interdependent self-construal, would influence the memory strategies used by Chinese immigrants to the US over time. Focusing on the effects of acculturation as a process that unfolds over time, we tested whether change in acculturation or cultural values is associated with change in cognitive strategies. Hypothesis one (H1) predicted that over time, an increase in orientation towards the host culture will predict an increase in the self-reference effect in memory. Similarly, hypothesis two (H2) predicted that over time, an increase in independence will predict an increase in the self-reference effect in memory. Hypothesis three (H3) predicted that over time, an increase in orientation towards the host culture will predict a decrease in the other-reference effect in memory. Lastly, hypothesis four (H4) predicted that an increase in independence will predict a decrease in the other-reference effect in memory.

2. Methods

2.1. Ethics approval

This study was approved by the Brandeis University Institutional Review Board (protocol reference number 12063R). All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

2.2. Participants

This study is a follow-up to a previous study (Gilliam and Gutches, 2024) of 92 Chinese participants. Sample size was based on an a priori power analysis conducted for time point one, which suggested that to test our hypotheses at time point one using linear regressions with a power of 0.8 and assuming a medium effect size, we would need a sample of at least 76 participants at time point one. We sampled to the end of the semester once we reached this initial sample size in order to collect data from at least that many participants, account for the possibility of some unusable data, and to account for attrition that could

affect our planned second time point of data collection.

Participants were contacted to return for a second time point of data collection. Those who opted to return did so between 11.54 months and 39.18 months after their initial session with a mean of 16.19 months ($SD = 5.58$ months, $Mdn = 14.93$ months).¹ Participants were Chinese students who were non-native speakers of English studying at Brandeis University. At their initial time point, they had lived in the US for fewer than five years and were between the ages of 18 and 26. All international students at Brandeis University are required to have a TOEFL score of at least 100 (advanced level English).

For the second time point of data collection, a total of 40 participants returned. However, four participants were excluded due to completely missing recognition task responses or missing survey data for primary variables in models. Missing responses reflected technical difficulties exacerbated by online data collection for the second session (e.g., interruption due to internet connection issues, using their computers’ disabled Numlock keys, etc.). One additional participant was excluded due to overall memory performance below chance, as this suggested a lack of task engagement or failure to understand instructions. Analyses focus on the remaining sample of 35 returning participants. Details of participants’ demographics (e.g., age, gender,² education) and session administration (e.g., current country of residence; whether they were online or in-person at time 1, reflecting adjustments in the protocol due to COVID-19) are summarized in Table 1.

2.3. Materials

This study used a self-referencing memory task, which involved the presentation of trait words. Words were selected from adjectives from Anderson (1968), such as “wealthy” or “nasty”, that had had been translated into Mandarin and used in Chinese samples previously (Chen, Wagner, Kelley, Powers, & Heatherton, 2013; Wang, 2005). The positivity of adjective word items was controlled for by sorting words into ‘bad’, ‘good’, and ‘neutral’ categories based on likability ratings from American subjects by Anderson (1968) and East Asian subjects by Wang (2005). These words were then divided into four counterbalanced lists with equivalent likability ratings. The lists were assigned to the four different conditions (three “old” conditions, and “new” words presented only at retrieval) in a counterbalanced manner so that the words were assigned to each condition across participants. Thus, new items were trait words from the same source and were equally balanced on valence in the same way as old items. Word lists were also then split into two groups (A, B) to avoid participants seeing the same items at time one and two. The order of these lists between sessions were assigned to participants in a counterbalanced manner (A time one and B time two versus B time one and A time two).³

All experimental materials were presented in simplified Mandarin to avoid priming American values through the English language, thus avoiding potential exaggeration of any acculturative or self-construal-related effects (see Kemmelmeier & Cheng, 2004; Dixon, 2007 for examples of language-culture priming effects). Two native Taiwanese who were fluent in simplified and traditional Mandarin and English and two native mainland Chinese who were fluent in simplified Mandarin and

Table 1
Demographic Table for Returning Participants.

Demographic Variable	N = 35
Age	
Time point 1	19.80 (1.81)
Gender	
Female	80 %
Male	17.1 %
Other	2.9 %
Race	
Asian	100 %
Education	
Time point 1	
High school graduate	14.3 %
Some college	62.9 %
2-year degree	0 %
4-year degree	22.9 %
Professional degree	0 %
Proportion of Chinese Close Friends	
Time point 1	
A few of them	2.9 %
About half of them	2.9 %
Most of them	65.7 %
All of them	28.5 %
Time point 2	
A few of them	0 %
About half of them	2.9 %
Most of them	68.6 %
All of them	28.5 %
In Person or Online	
Time point 1	
In person	45.7 %
Online	54.3 %
Time point 2	
In person	0 %
Online	100 %
Current Country of Residence	
Time point 1	
China	17.1 %
USA	82.9 %
Time point 2	
China	20 %
USA	80 %
Mean Months b/w Time Points	16.19 (5.58) Range: [11.54–39.18]

English provided collaborative translations of all English and traditional Mandarin materials into simplified Mandarin and edited wordings identified by pilot participants as inaccurate or awkward simplified Mandarin translations. Task instructions were translated to simplified Mandarin from English. For questionnaires, some materials had pre-existing simplified Mandarin translations that were evaluated for accuracy while others were traditional Mandarin translations that were translated to simplified Mandarin. Translators reviewed each other’s translations for accuracy until consensus was reached that no further changes were needed.

2.4. Procedure

For both timepoint 1 and timepoint 2, the entire experimental procedure, including the memory task and questionnaires, took approximately 45 min to complete. The second session was administered entirely online. Participants first signed an informed consent form, then they were redirected in their browser to begin the main self-referencing memory experiment. Participants completed encoding and retrieval tasks. Prior to encoding, participants were asked to choose a “close other” (one person) and “farm animal” (one category like “pigs” or “cows” in general) to think of throughout the duration of the experiment (as in Zhang et al., 2020 and Gilliam & Gutchess, 2024). Instructions were provided in the initial email with study links, at the end of the initial form where they provided informed consent, and at the start of the experiment in Pavlovía to ensure appropriate engagement with the

¹ Despite this variation, when adding time (number of months) between sessions one and two into models as a covariate, there was no change to our model results.

² There is a mixed literature on the relationship between gender and cultural values (see Watkins et al., 2003). Despite our sample being heavily female, when gender was added to the models as an additional covariate there was no change in model results and no effect of gender on outcomes of interest.

³ Based on Welch two sample *t*-test results, wordlists did not vary significantly in terms of memory performance (hits-minus-false alarms) for either self ($t(45.97) = -1.29, p = 0.20$) or close other conditions ($t(42.11) = -1.50, p = 0.14$).

task. During encoding, participants studied 54 to 55 trait-based words (depending on word lists), presented in Simplified Mandarin on a computer screen. Across trials, participants responded as to whether the words describe either themselves, a close other, or a farm animal, used as a control condition, by pressing 1 for “yes” or 2 for “no”. Word items were presented in subject-specific random order for a maximum of 7 s each at encoding with 250 millisecond intervals between targets. Encoding trials continued when participants responded with a keypress before 7 s had passed.

Next was a 10-min retention interval during which time there was a break. The task was programmed so that instructions would not progress until 10 min had passed (with a visual countdown clock on the screen the entire period) so that sessions were easily completed without experimenters being present. During the recognition task, participants then decided whether adjectives were “old” (previously studied) or “new” (not studied previously). The task was self-paced; once participants responded with a keypress, a blank screen appeared for 250 msec before the program advanced to the next trial. Participants performed the retrieval task for a total of 73 adjectives: 18–19 new words not studied previously and 54–55 old words that were previously studied, with 18–19 words per reference condition (self, close other, and farm animal).

Participants were then redirected a final time to complete a Qualtrics survey. This survey included general demographics measures presented in Simplified Mandarin that allowed the samples to be characterized (see Table 1), and to be compared between-subjects and within-subject over the two time points on individual difference variables of interest. Primary predictors of memory performance from survey measures were 1) the acculturation orientation scale (AOS; Demes & Geeraert, 2014) to assess individuals’ relationships to their culture of origin and their culture of contact, and 2) the Singelis Self-Construal Scale (SCS; Singelis, 1994) to measure independence and interdependence. Both of these scales used 1–7 bidimensional Likert scales to indicate disagreement to agreement. Sample reliability for the AOS and Singelis Self-Construal subscales were found in our previous study to be adequate at time point 1 (Gilliam and Gutchess, 2024) and were also adequate at time point 2 (independence $\alpha = 0.65$, interdependence $\alpha = 0.69$, AOS home $\alpha = 0.84$, AOS host $\alpha = 0.81$). In the current study, test-retest reliability was acceptable for adjusted host score ($r = 0.71, p < 0.001$) and good for adjusted independence ($r = 0.82, p < 0.001$).

Depressive symptoms could impact self-referencing, memory, or level of engagement within a new cultural environment, so we included the Center for Epidemiologic Studies Depression Scale in our questionnaires and as a model covariate (CES-D; Zhang et al., 2011). The CES-D has a 1–4 (from rarely to most or all of the time) Likert scale and total scores range from 20 to 80. See Table 2 for descriptive information and correlations among questionnaires.

In terms of who participants chose for their close other, at time point two 28.57 % of participants chose a best friend, 42.86 % chose a mother, 25.71 % chose a romantic partner, and 2.86 % chose a sibling. Choices

for close other were similar between time points, although the question was added partway through data collection for time point one. In addition to this, we asked participants at time point two if they chose the same close other in both sessions. 26 participants remembered their choices, half of which self-reported that they chose the same close other at both sessions.

2.5. Scoring and data analysis

All results presented will be for returning participants only. Overall memory performance across conditions was scored as hits, or the proportion of correct responses to old items, minus false alarms, the number of new items mistakenly remembered as being seen before. The false alarm (FA) rate was the same for all conditions.

For all linear regressions, memory performance was quantified using only the hit rate for each reference condition. This is because the false alarm rate was the same for each condition (i.e., there was only one pool of “new” items rather than being specific to each condition), and thus does not add additional information. Difference scores were calculated for self minus close other at both time points, and difference scores were calculated for close minus farm animal at both time points. These were then used to create a time-differenced measure of change in self-referencing between time one and time two to test hypotheses one and three and a measure of change in other-referencing between time one and time two to test hypotheses two and four.

Difference scores were also calculated for predictors of interest, such that self-construal was operationalized as independence minus interdependence⁴ (Adjusted Independence Score), as has been done in prior studies (Gilliam & Gutchess, 2024; Kraus et al., 2021; Yu et al., 2021). Similarly, acculturation orientation was operationalized as host minus home (Adjusted Host Acculturation Score). Using difference scores allowed for a relative measure of an individual’s tendency towards one style or another, collapsing scores for related constructs into a single measure and minimizing the influence of response bias that could impact the interpretation of scores across individuals. Time-differenced measures were then created by subtracting adjusted host acculturation score at time two from time one and doing the same for adjusted independence score.

3. Results

3.1. Tests for sampling bias, potential confounds, and collinearity

To ensure there was no sampling bias that could influence our results, the returning sample and non-returning sample were tested for differences in terms of memory (i.e., average hits and overall false alarms), predictors of interest (i.e., acculturation orientation and self-construal), or the control variable used in models (i.e., depressive symptoms) at time one using Welch two-sample *t*-tests. These tests found no significant differences between attritors and returning participants, indicating that there does not seem to have been any attrition-related bias in our sample. See supplement A for details of these *t*-tests and see supplement B for results of an outlier analysis among primary variables of interest.

Paired *t*-tests were also used to evaluate if overall memory performance or number of depressive symptoms changed between time points for the returning sample as each could act as potential confounds. There was no change in average number of hits ($t(34) = 0.75, p = 0.46$) or false alarms ($t(34) = -0.05, p = 0.96$), but there was a significant increase in depressive symptoms from time one to time two ($t(34) = -3.27, p < 0.01$). Thus, the measure of depressive symptoms was included as a

Table 2
Descriptives and Correlations for Model Predictors & Covariate at Time Point Two.

Variable: time point 2	Mean (SD)	1.	2.	3.	4.	5.
1. Independence	4.60 (0.61)		−0.21	0.10	−0.11	−0.22
2. Interdependence	4.58 (0.63)			−0.01	0.17	0.20
3. AOS Host orientation	4.61 (0.95)				0.25	0.31
4. AOS Home orientation	4.84 (1.16)					−0.09
5. Depressive Symptoms (CES-D)	37.54 (11.71)					

Notes: * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

⁴ See supplemental material G for a follow-up analysis exploring the individual contributions of change in unadjusted independence and interdependence on change in memory performance.

covariate in models of change (results reported in supplement D).

In order to assess potential issues of collinearity, correlations were run at time point 1 and time point 2 separately to see if the outcomes, predictors of interest, and the control variable were associated with one another. Correlations were also run for the same variables when time-differenced to examine if change in one might be associated with change in another. Resulting correlation matrices can be found in supplement C. Primary predictor variables of interest were not highly correlated with each other, and thus were included in separate models.

3.2. ANOVA results: Self-reference effect at both time points

A repeated measures two-way ANOVA was run, comparing corrected memory performance (hits minus false alarms) by reference condition and time of experiment as well as the interaction between the two. This allowed us to test if self significantly differed from close other at both time points, thus indicating a self-reference effect regardless of time. See Fig. 1 for a bar graph displaying corrected memory performance by reference and time of experiment. Results suggested that there was a significant main effect of reference condition on memory performance ($F(2, 68) = 44.10, p < 0.001, \eta^2 = 0.57$), but that there was no significant main effect of time of experiment ($F(1, 34) = 1.56, p = 0.22, \eta^2 = 0.04$). There was no significant interaction between reference condition and time of experiment ($F(1.66, 56.31) = 0.10, p = 0.87, \eta^2 = 0.003$). To break down the main effect of reference condition using post-hoc t -tests with p -values adjusted using Bonferroni corrections, when collapsing across time there was a significant difference between self and close other conditions ($t(69) = 4.59, p < 0.001$), between self and farm conditions ($t(69) = 9.17, p < 0.001$), and between close other and farm conditions ($t(69) = 5.77, p < 0.001$).

3.3. Regression model results: Change between time points

Linear regressions were then run to examine within-subject change over a period of 16 months in acculturation and memory patterns using time-differenced variables. The models were:

Outcome : T2-T1 Self minus close hits	
M1. $Y_i = \alpha + \beta T2-T1AdjustedHost_i + \epsilon$	M2. $Y_i = \alpha + \beta T2-T1AdjustedIndependence_i + \epsilon$
Outcome : T2-T1 Close minus farm hits	
M3. $Y_i = \alpha + \beta T2-T1AdjustedHost_i + \epsilon$	M4. $Y_i = \alpha + \beta T2-T1AdjustedIndependence_i + \epsilon$

See Fig. 2 for scatterplots presenting the model results.

First, we tested whether an increase in orientation towards US host culture (i.e., greater acculturation to the US) would predict an increase in the size of the self-reference effect in memory over the 16-month

period (H1). Results demonstrate that change in adjusted host score significantly predicts change in self minus close hits, such that an increase in host culture orientation is associated with a larger self-reference effect in memory, defined as an enhancement in memory for self as compared to close other ($\beta = 0.41, t(33) = 2.60, p = 0.01$). This is a medium effect size with a Bayes factor (BF) suggesting moderate evidence for the alternative hypothesis ($BF = 3.95$). To further characterize this effect, if one were to experience an increase in adjusted host score of one standard deviation (1.45 units on a measure with a sample range of -2.75 to 1.75), they would have an associated increase of 0.41 standard deviation in the self-reference effect in memory (a change of 0.06 units on a measure that ranged from -0.38 to 0.34 , i.e. a change equal to 12 % of the sample's range).

We also tested the relationship between self-construal and memory outcomes. Specifically, we tested whether an increase in independent self-construal over time would predict an increase in the size of the self-reference effect over time (H2). Change in adjusted independence did not significantly predict change in self minus close hits ($\beta = 0.12, t(33) = 0.71, p = 0.48$). The Bayes factor suggested that there was anecdotal evidence for the null ($BF = 0.40$).

We then assessed whether increased orientation towards US host culture would predict a decreased other-reference effect in memory over time (H3). Change in adjusted host score did not significantly predict change in close minus farm hits but there was a trend in the expected direction ($\beta = -0.32, t(33) = -1.95, p = 0.06$). Although the standardized coefficient value suggested a medium effect size, the Bayes factor suggested there was only anecdotal evidence for the alternative hypothesis ($BF = 1.37$).

Lastly, we tested whether an increase in independent self-construal over time would predict a decrease in the size of the other-reference effect over time (H4). Change in adjusted independence significantly predicted change in close minus farm hits, such that an increase in independence is associated with a smaller other reference effect, that is, similar memory performance on the close other and farm animal conditions ($\beta = -0.36, t(33) = -2.24, p = 0.03$). The standard coefficient suggested a medium effect size and the Bayes factor suggested that there was anecdotal evidence for the alternative hypothesis ($BF = 2.13$). To further interpret this effect, if one were to experience a one standard deviation increase in adjusted independence (0.57 units on a measure with a sample's range of -1.20 to 1.13), there would be an associated decrease of 0.36 standard deviation in the other-reference effect in memory (0.25 units on a measure with a sample's range of -0.42 to 0.78 ; i.e. a change of 21 % of the sample's range).

All model results reported here remained significant when adding number of depressive symptoms to models as a covariate (see supplement D). Additionally, we ran models with a focus on the influence of individual differences in predictors of interest to test whether the

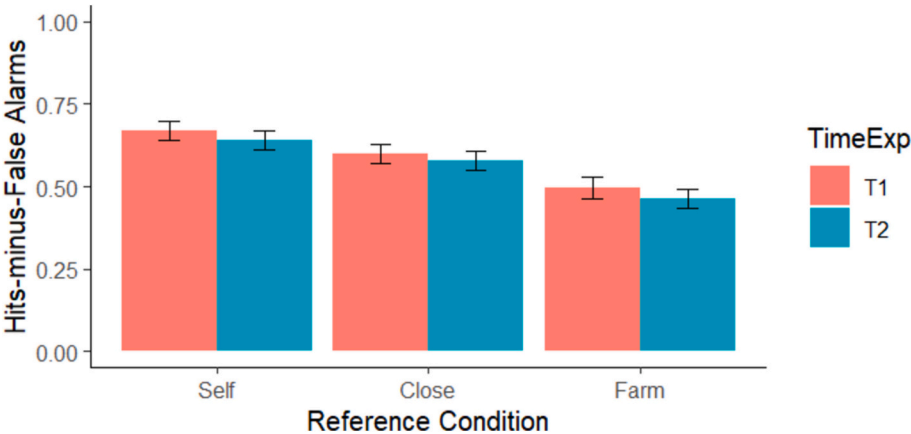


Fig. 1. Bar Graph of Memory Performance by Reference Condition by Time Point.

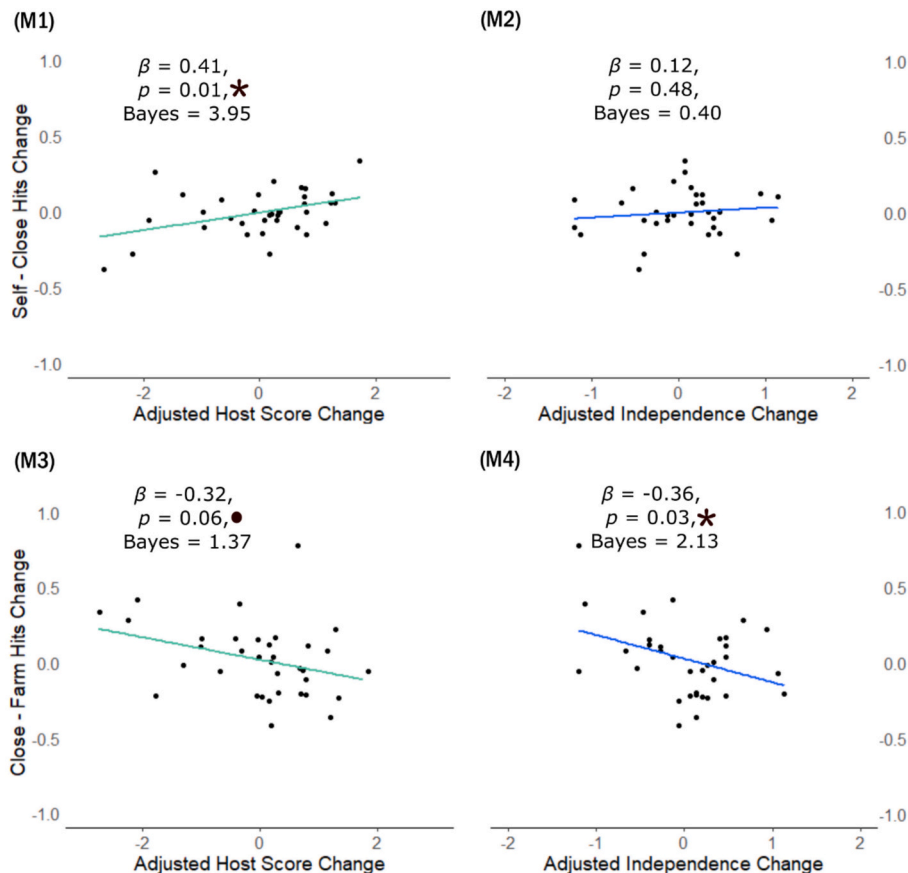


Fig. 2. Linear Regression Results for Change in Memory and Acculturation Over Time.

Note: * indicates significance at $p < 0.05$ and ‘.’ indicates a non-significant trend in the data ($0.05 < p < 0.10$).

pattern of results at the initial time point (reported in (Gilliam and Gutchess, 2024)) replicated at the 2nd time point. Results did replicate in our subsample of returning participants (see supplement E).

3.4. Exploratory replication of our findings in larger combined study sample

To address concerns about the study's sample size ($n = 35$), we combined our sample with that of another study of ours using the same design. This allowed us to demonstrate that effects were robust. Separate groups of participants completed each study. This second study was conducted with a focus on neural analysis and thus there were a few differences: 1) Study 2 had a smaller sample size ($n = 29$), powered to detect neural rather than behavioral effects; 2) Study 2 employed a shorter time frame between time points one and two (average of ~ 7.5 months, rather than ~ 16 months); 3) Study 2 took place about two years after study 1 had ended and after the end of the closures and disruption related to the COVID-19 pandemic (participants were recruited between February 2023 and February 2024, rather than between December 2019 and January 2021); 4) Participants in study 2 had higher levels of depressive symptoms compared to those in study 1 (see details of *t*-tests comparing samples used in supplement H).

After combining the behavioral data from the two studies, the total combined sample size was 64 participants, reaching the required power for change over time analyses (see supplement H for power analysis details). Each participant had two time points of data. These follow-up analyses were pre-registered on OSF. It should be noted that the shorter time frame between sessions (\sim half a year rather than \sim a year and a half) for study 2 may diminish effects. It is also possible that some effects may be more impactful at earlier time periods and less impactful

at later time periods. However, effects are reported here pooling across studies in order to test for replication of our findings in a larger sample.

Regression analysis utilized the same models as the original analysis with the addition of appropriate control variables to account for study differences. Specifically, in addition to change in depressive symptoms (CES-D), study identifier (dummy coded for study 1 and 2), and time in the United States at initial participation were included in models. Change in depressive symptoms (CES-D) was included as a control variable to mirror supplemental D as well as due to differences in depressive symptoms between samples. Time in the United States and study identifier were both included as additional covariates due to the differences between samples in number of weeks between time points and to control for any potential variation in time in the United States prior to time point 1 (for example, due to COVID restrictions in study 1 versus study 2). Note that there was a high correlation ($r = -0.70$) between the number of weeks between sessions and study identifier, so the former was not included in models.

Outcome : T2-T1 Self minus close hits

$$\text{M1. } Y_i = \alpha + \beta \text{T2-T1AdjustedHost}_i + \beta \text{StudyID}_i + \beta \text{USTime}_i + \beta \text{CESD}_i + \varepsilon$$

Outcome : T2-T1 Close minus farm hits

$$\text{M3. } Y_i = \alpha + \beta \text{T2-T1AdjustedHost}_i + \beta \text{StudyID}_i + \beta \text{USTime}_i + \beta \text{CESD}_i + \varepsilon$$

Effects found for self-referencing were replicated in our combined analysis. Results from the combined analysis replicated the effect of change in adjusted host score on change self-minus-close hits (H1), such that an increase in host culture orientation is associated with a larger

self-reference effect in memory ($\beta = 0.26$, $t(59) = 2.04$, $p = 0.046$). This is a small effect size with a Bayes factor (BF) suggesting anecdotal evidence for the alternative hypothesis ($BF = 1.33$). Results from the combined analysis replicated a lack of effect of adjusted independence on self-referencing (H2) ($\beta = 0.13$, $t(59) = 1.00$, $p = 0.32$, $BF = 0.35$).

Effects found for close other-referencing were replicated in our combined analysis. Results from the combined analysis demonstrate a significant effect in the same direction as the trend originally found in favor of H3, such that an increase in host culture orientation is associated with a smaller other-reference effect in memory ($\beta = -0.34$, $t(59) = -2.82$, $p = 0.006$). This is a medium effect size with a Bayes factor suggesting moderate evidence for the alternative hypothesis ($BF = 5.22$). Results from the combined analysis also replicated a significant effect of change in adjusted independence on change in other-referencing, such that greater independence is associated with more similar memory performance on the close other and farm animal conditions ($\beta = -0.26$, $t(59) = -2.17$, $p = 0.03$). This is a small effect size with a Bayes factor suggesting anecdotal evidence for the alternative hypothesis ($BF = 1.07$).

Additionally, dummy-coded study identifier was a significant predictor of change in close-referencing both in models that included adjusted host score ($\beta = -0.29$, $t(59) = -2.26$, $p = 0.03$, $BF = 0.86$) and that included adjusted independence ($\beta = -0.32$, $t(59) = -2.36$, $p = 0.02$, $BF = 0.86$), meaning participants in study 2 displayed greater change in close-referencing than study 1.

4. Discussion

Results provide support that acculturative changes within individuals over time, as people adjust to a new cultural milieu, relate to changes in memory that reflect the use of mnemonic strategies. Both self- and other-referencing were associated with acculturation. Change in adjusted host culture orientation predicted change in self-referencing, supporting hypothesis one (H1). Change in adjusted independence significantly predicted change in close other-referencing, supporting hypothesis four (H4). There was a non-significant trend in the predicted direction of hypothesis three as adjusted host culture orientation predicted change in close other-referencing (H3), indicating that further research with a larger, more varied sample may be warranted. However, hypothesis two was not supported; change in adjusted independence did not significantly predict change in self-referencing (H2). Results were robust and will be discussed in terms of potential implications.

Our findings suggest that as individuals acculturate to a new context, their memory strategies change in tandem with their acculturation and self-construal. Generally, discussions of self-referencing have focused more on the self and less on close others, with one possible mechanism being that an independent self-construal leads to more of a benefit for the self in memory (Lee & Heo, 2016; Mattavelli, Richetin, Gallucci, & Perugini, 2017; Zhang et al., 2020). However, our findings suggest that both memory for the self and close others change with acculturation. Specifically, an increase in orientation towards one's host culture (relative to one's home culture) over time was associated with a larger self-reference effect in memory. In other words, as Chinese students became more oriented towards American culture, they demonstrated more American-like cognitive strategies in their memory. This supported H1. There was also a complementary non-significant trend in line with H3, such that as Chinese students became more oriented towards American culture, they demonstrated less Chinese-like cognitive strategies in their memory (i.e., less of a memory boost when referencing close others).

Few studies have examined the impact of acculturation on the self, but findings thus far are mixed (Mesquita, De Leersnyder, & Jasini, 2019; Walker, Deng, & Dieser, 2001; Yilmaz, Phalet, & De Leersnyder, 2024). Considering the lack of correlation between acculturation orientation and self-construal, and their differential effects on memory strategies, the effect of acculturation orientation appears to be distinct.

Our pattern of findings for change in other-referencing and change in adjusted independence contributes to the literature on this topic. However, it does not appear that changes in self-construal are the most likely mechanism for acculturative change in cognitive strategies identified in our study.

The acculturation orientation measure emphasizes desire to engage with one's host and home culture and to embrace its typical behaviors and values; thus, our results would suggest that one's intention to engage with a culture may impact whether one engages in information processing strategies preferred by the host culture, including memory strategies. Future research will need to assess aspects of actual cultural engagement and use richer measures than a single questionnaire to further tease apart this relationship, however. To our knowledge, only one study thus far has demonstrated evidence for the relationship between host culture engagement and fit with host culture patterns of the self, for example measuring direct social contact, proportion of life spent in the host context, language use, and communicative proficiency (Yilmaz et al., 2024).

Acculturative effects seem the most compelling for change in acculturation orientation over time, although we found similar patterns for independence. However, counter to previous assumptions, change in self-construal (independence) is actually only related to change in memory for close others. Specifically, an increase in independence (relative to interdependence) was associated with a reduction in the benefits from referencing close others in memory as compared to a control condition, supporting H4. This means that as someone became more American-like in their self-construal values (i.e., more independent, and less attuned to close others), they demonstrated more American-like cognitive strategies in their memory. In fact, in our supplemental analysis examining the unadjusted subscales, it is change in interdependence, not independence, that is predictive of memory strategy change (see supplemental material G).

Although most research investigates how self-referencing enhances memory for one cultural group more than another cross-sectionally, our results go beyond this approach by investigating change related to acculturation within an individual over time. This approach allows us to identify specific mechanisms that could account for cultural differences, such as the extent to which one feels in alignment with the host culture or conceptualizes the self as independent. No other study that we are aware of has investigated the influence of these acculturative changes on cognition.

The results also highlight the potential in focusing on the close other and how it changes over time. Some literature suggests that certain close others – mothers and fathers – can lead to memory boosts similar to that of the self for East Asians (Sui et al., 2007; Zhu et al., 2007). To claim that changes in the effectiveness of the close other condition reflect changes in the effectiveness of close other referencing as a mnemonic strategy for Chinese students acculturating to American culture, it is necessary to rule out other explanations. For example, it could be the case that Chinese students' relationships with close others changed due to relocation (e.g., who they select for their close other, how close they feel to that individual, how physically distant they are). Exploratory analyses suggest that similar close others were referenced across testing sessions, though these are based on small samples and lacking rich measures about the relationship. Specifically, there were no memory performance differences between types of close others chosen by participants, no differences in the effectiveness of self- and other-referencing between individuals who chose the same close others as compared to those who chose different close others across time 1 and time 2, or between individuals living in China as compared to those living in the US at time of testing (see supplement F). Future research should also explore if the type of culturally-fair distant others used as a control or comparison condition (e.g., farm animal) might impact effects. Future studies should further replicate and probe these aspects of the relationship with the close other using larger sample sizes. Regardless of whom participants choose as their reference, we speculate that

the effectiveness of the self and close other as *mnemonic strategies* may be changing over time.

In contrast to the effects of acculturation orientation and independence that emerged within subjects over time, we did not find any significant effects of acculturation or self-construal on memory strategies when comparing between subjects at the later time point (supplement E), replicating our prior findings based on the full sample at the initial time point (Gilliam and Gutches, 2024). Rather than focusing on the variability between participants, the present study is one of very few memory studies to explicitly examine the impact of acculturation, using a longitudinal approach that assesses change within individuals over time. To our knowledge, this is the first study to demonstrate change in a cognitive strategy that is associated with change in an aspect of acculturation. This further reinforces the importance of thinking of acculturation as a dynamic process that occurs over time and can fluctuate depending on context.

Our results suggest that memory researchers should consider the influence of acculturation on cognitive strategies. Adjusted acculturation orientation is a potentially useful measure for memory researchers to include in their studies, especially when examining bicultural individuals. This measure appears particularly useful in studies with multiple time points, as researchers can examine how trajectories for immigrant groups change over time as they engage with American culture and values to varying degrees. What cognitive strategy someone finds most beneficial or appropriate could change with cross-cultural engagement, which could have important implications for educational settings. Moreover, these results could have applications for older adults, as interventions for age-related memory decline may not be equally effective for people from different cultures. Assessing acculturation orientation may be helpful to better understand for whom a memory strategy will be more or less effective and guide use of culturally-sensitive memory strategies and interventions throughout an individual's lifetime.

It is important to note that the relationship between acculturation and cognition will likely vary across samples. Our current sample is limited due to its homogeneity and thus is not representative of all East Asian samples or even all Chinese samples. Future research should explore the effects of acculturation on memory with more heterogeneous samples (e.g., more variation in terms of age, national/regional origin, socioeconomic status, social network composition in terms of race or nationality, or circumstances of immigration such as whether it is voluntary or necessitated by conflict or natural disaster). Furthermore, future research can better understand the time course over which acculturation influences memory strategies. Our sample had been in the United States for an average of 1 year at the time of the first session and completed the second session an average of 16 months later. Whether effects are pronounced over initial time spent in a new culture or unfold slowly as well as whether there are sensitive periods during development most prone to acculturative change are intriguing questions to be addressed by future studies. Previous work (e.g., Caparos et al., 2012; Cheung, Chudek, & Heine, 2011; Chudek, Cheung, & Heine, 2015; Cramer, Dusko, & Rensink, 2016; Heine & Lehman, 2004) provides mixed evidence and none of these studies investigate mnemonic strategies. In the present study, there were no effects of time spent in the United States in our study when it was added to models as a covariate. Measures of acculturation also may need to be adapted for specific cultural contexts. Extending research to assess how acculturation influences other domains of cognition and in additional cultural groups (e.g., Latin Americans; Kitayama & Salvador, 2017) are important directions for future research. Future work may also benefit from teasing apart differential memory strategy outcomes for individuals who endorse various forms of acculturation orientations (e.g., integration, assimilation, marginalization, separation, see Berry, 1992).

In conclusion, change in acculturation can influence memory and effectiveness of cognitive strategies in as little as 16 months. Further research is needed to better understand these findings' implications and

the broader impact of acculturation on memory and cognitive patterns.

Ethics approval

The reported study was approved by the human subjects review committee at Brandeis University.

Data, material, and code availability

De-identified and averaged data, statistical analysis code in R, or other research materials are available upon reasonable request. This study was not preregistered.

CRediT authorship contribution statement

Ashley N. Gilliam: Writing – review & editing, Writing – original draft, Visualization, Investigation, Formal analysis, Conceptualization.
Angela Gutches: Writing – review & editing, Supervision.

Declaration of competing interest

The authors have no relevant financial or non-financial interests to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cognition.2024.105985>.

Data availability

Data available upon request from researchers. IRB does not cover OSF sharing

References

- Anderson, N. H. (1968). Likableness ratings of 555 personality-trait words. *Journal of Personality and Social Psychology*, 9(3), 272. <https://doi.org/10.1037/h0025907>
- Arends-Tóth, J., & Van de Vijver, F. J. (2004). Domains and dimensions in acculturation: Implicit theories of Turkish-Dutch. *International Journal of Intercultural Relations*, 28(1), 19–35.
- Benet-Martínez, V., Leu, J., Lee, F., & Morris, M. W. (2002). Negotiating biculturalism: Cultural frame switching in biculturals with oppositional versus compatible cultural identities. *Journal of Cross-Cultural Psychology*, 33(5), 492–516. <https://doi.org/10.1177/0022022102033005005>
- Berry, J. W. (1992). Acculturation and adaptation in a new society. *International Migration*, 30, 69.
- Caparos, S., Ahmed, L., Bremner, A. J., de Fockert, J. W., Linnell, K. J., & Davidoff, J. (2012). Exposure to an urban environment alters the local bias of a remote culture. *Cognition*, 122(1), 80–85. <https://doi.org/10.1016/j.cognition.2011.08.013>
- Chen, P. H. A., Wagner, D. D., Kelley, W. M., & Heatherton, T. F. (2015). Activity in cortical midline structures is modulated by self-construal changes during acculturation. *Culture and Brain*, 3, 39–52. <https://doi.org/10.1007/s40167-015-0026-z>
- Chen, P. H. A., Wagner, D. D., Kelley, W. M., Powers, K. E., & Heatherton, T. F. (2013). Medial prefrontal cortex differentiates self from mother in Chinese: evidence from self-motivated immigrants. *Culture and Brain*, 1, 3–15. <https://doi.org/10.1007/s40167-013-0001-5>
- Cheung, B. Y., Chudek, M., & Heine, S. J. (2011). Evidence for a sensitive period for acculturation: Younger immigrants report acculturating at a faster rate. *Psychological Science*, 22(2), 147–152. <https://doi.org/10.1177/0956797610394661>
- Chudek, M., Cheung, B. Y., & Heine, S. J. (2015). US immigrants' patterns of acculturation are sensitive to their age, language, and cultural contact but show no evidence of a sensitive window for acculturation. *Journal of Cognition and Culture*, 15(1–2), 174–190. <https://doi.org/10.1163/15685373-12342145>
- Cramer, E. S., Dusko, M. J., & Rensink, R. A. (2016). Group-level differences in visual search asymmetry. *Attention, Perception, & Psychophysics*, 78, 1585–1602. <https://doi.org/10.3758/s13414-016-1137-0>
- Demes, K. A., & Geeraert, N. (2014). Measures matter: Scales for adaptation, cultural distance, and acculturation orientation revisited. *Journal of Cross-Cultural Psychology*, 45(1), 91–109. <https://doi.org/10.1177/0022022113487590>
- Dixon, D. J. (2007). The effects of language priming on independent and interdependent self-construal among Chinese university students currently studying English. *Current Research in Social Psychology*, 13(1), 1–9.

- Gilliam, A. N., & Gutchess, A. (2024). Influence of acculturation and cultural values on the self-reference effect. *Scientific Reports*, 14, 1624. <https://doi.org/10.1038/s41598-023-46210-z>
- Gutchess, A. H., Kensinger, E. A., Yoon, C., & Schacter, D. L. (2007). Ageing and the self-reference effect in memory. *Memory*, 15(8), 822–837. <https://doi.org/10.1080/09658210701701394>
- Han, S., Northoff, G., Vogeley, K., Wexler, B. E., Kitayama, S., & Varnum, M. E. W. (2013). A Cultural Neuroscience Approach to the Biosocial Nature of the Human Brain. *Annual Review of Psychology*, 64(1), 335–359. <https://www.annualreviews.org/doi/10.1146/annurev-psych-071112-054629>
- Heine, S., & Lehman, D. (2004). Move the body, change the self: Acculturative effects on the self-concept. In M. Schaller, & C. Crandall (Eds.), *Psychological foundations of culture* (pp. 305–331). Mahwah, NJ: Erlbaum.
- Hong, Y. Y., Morris, M. W., Chiu, C. Y., & Benet-Martinez, V. (2000). Multicultural minds: A dynamic constructivist approach to culture and cognition. *American Psychologist*, 55(7), 709. <https://doi.org/10.1037/0003-066X.55.7.709>
- Huff, S., Yoon, C., Lee, F., Mandadi, A., & Gutchess, A. H. (2013). Self-referential processing and encoding in bicultural individuals. *Culture and Brain*, 1, 16–33.
- Ji, L. J., Peng, K. P., & Nisbett, R. E. (2000). Culture, control, and perception of relationships in the environment. *J Pers Soc Psychol*, 78(5), 943–955. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=10821200
- Kemmelmeyer, M., & Cheng, B. Y. M. (2004). Language and self-construal priming: A replication and extension in a Hong Kong sample. *Journal of Cross-Cultural Psychology*, 35(6), 705–712. <https://doi.org/10.1177/0022022104270112>
- 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. <https://doi.org/10.1111/1467-9280.02432>
- Kitayama, S., & Salvador, C. E. (2017). Culture embrained: Going beyond the nature-nurture dichotomy. *Perspectives on Psychological Science*, 12(5), 841–854. <https://doi.org/10.1177/1745691617707317>
- Klein, S. B., & Kihlstrom, J. F. (1986). Elaboration, organization, and the self-reference effect in memory. *Journal of Experimental Psychology: General*, 115(1), 26. <https://doi.org/10.1037/0096-3445.115.1.26>
- Kraus, B., Salvador, C. E., Kamikubo, A., Hsiao, N. C., Hu, J. F., Karasawa, M., & Kitayama, S. (2021). Oscillatory alpha power at rest reveals an independent self: A cross-cultural investigation. *Biological Psychology*, 163, Article 108118. <https://doi.org/10.1016/j.biopsycho.2021.108118>
- Lechuga, J. (2008). Is acculturation a dynamic construct? The influence of method of priming culture on acculturation. *Hispanic Journal of Behavioral Sciences*, 30(3), 324–339. <https://doi.org/10.1177/0739986308319570>
- Lee, S., & Heo, J. (2016). The moderating role of cultural orientation in explaining temporal orientation of self-referencing. *Asian Journal of Communication*, 26(4), 333–349.
- Liebkind, K. (2006). Ethnic identity and acculturation. *The Cambridge Handbook of Acculturation Psychology*, 78–96.
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98(2), 224.
- 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. <https://doi.org/10.1037/0022-3514.81.5.922>
- Matsuda, T. (2006). Measures of psychological acculturation: A review. *Transcultural Psychiatry*, 43(3), 462–487.
- Mattavelli, S., Richetin, J., Gallucci, M., & Perugini, M. (2017). The self-referencing task: theoretical overview and empirical evidence. *Journal of Experimental Social Psychology*, 71, 68–82.
- Mesquita, B., De Leersnyder, J., & Jasini, A. (2019). The cultural psychology of acculturation. In *Handbook of cultural psychology* (2nd ed., pp. 502–535). The Guilford Press.
- Murray, K. E., Klonoff, E. A., Garcini, L. M., Ullman, J. B., Wall, T. L., & Myers, M. G. (2014). Assessing acculturation over time: A four-year prospective study of Asian American young adults. *Asian American Journal of Psychology*, 5(3), 252. <https://psycnet.apa.org/doi/10.1037/a0034908>
- Ng, S. H., & Lai, J. C. (2009). Effects of culture priming on the social connectedness of the bicultural self: A self-reference effect approach. *Journal of Cross-Cultural Psychology*, 40(2), 170–186. <https://doi.org/10.1177/0022022108328818>
- Redfield, R., Linton, R., & Herskovits, M. J. (1936). Memorandum for the study of acculturation. *American Anthropologist*, 38(1), 149–152.
- Rogers, T. B., Kuiper, N. A., & Kirker, W. S. (1977). Self-reference and the encoding of personal information. *Journal of Personality and Social Psychology*, 35(9), 677. <https://psycnet.apa.org/doi/10.1037/0022-3514.35.9.677>
- Schrauf, R. W. (2002). Comparing cultures within-subjects: A cognitive account of acculturation as a framework for cross-cultural study. *Anthropological Theory*, 2(1), 98–115. <https://doi.org/10.1177/1463499602002001290>
- Singelis, T. M. (1994). The measurement of independent and interdependent self-construals. *Personality and Social Psychology Bulletin*, 20(5), 580–591. <https://doi.org/10.1177/0146167294205014>
- Sui, J., Zhu, Y., & Chiu, C. Y. (2007). Bicultural mind, self-construal, and self and mother-reference effects: Consequences of cultural priming on recognition memory. *Journal of Experimental Social Psychology*, 43(5), 818–824. <https://doi.org/10.1016/j.jesp.2006.08.005>
- Symons, C. S., & Johnson, B. T. (1997). The self-reference effect in memory: A meta-analysis. *Psychological Bulletin*, 121(3), 371. <https://psycnet.apa.org/doi/10.1037/0033-2909.121.3.371>
- Varnum, M. E., & Grossmann, I. (2017). Cultural change: The how and the why. *Perspectives on Psychological Science*, 12(6), 956–972.
- Wagar, B. M., & Cohen, D. (2003). Culture, memory, and the self: An analysis of the personal and collective self in long-term memory. *Journal of Experimental Social Psychology*, 39(5), 468–475. [https://doi.org/10.1016/S0022-1031\(03\)00021-0](https://doi.org/10.1016/S0022-1031(03)00021-0)
- Walker, G. J., Deng, J., & Dieser, R. B. (2001). Ethnicity, acculturation, self-construal, and motivations for outdoor recreation. *Leisure Sciences*, 23(4), 263–283.
- Wang, D. (2005). *Explorations of Chinese Personality*. Beijing: Social Sciences Academic Press.
- Wang, Q. (2013). Chinese socialization and emotion talk between mothers and children in native and immigrant Chinese families. *Asian American Journal of Psychology*, 4(3), 185. <https://psycnet.apa.org/doi/10.1037/a0030868>
- Wang, Q., & Conway, M. A. (2004). The stories we keep: autobiographical memory in American and Chinese middle-aged adults. *J Pers*, 72(5), 911–938. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15335332
- Wang, Q., Koh, J. B. K., & Song, Q. (2015). Meaning making through personal storytelling: Narrative research in the Asian American context. *Asian American Journal of Psychology*, 6(1), 88. <https://psycnet.apa.org/doi/10.1037/a0037317>
- Wang, Q., & Ross, M. (2005). What we remember and what we tell: The effects of culture and self-priming on memory representations and narratives. *Memory*, 13(6), 594–606. <https://doi.org/10.1080/09658210444000223>
- Wang, Q., Shao, Y., & Li, Y. J. (2010). “My way or mom’s way?” The bilingual and bicultural self in Hong Kong Chinese children and adolescents. *Child Development*, 81(2), 555–567. <https://doi.org/10.1111/j.1467-8624.2009.01415.x>
- Wang, Q., Song, Q., & Kim Koh, J. B. (2017). Culture, memory, and narrative self-making. *Imagination, Cognition and Personality*, 37(2), 199–223. <https://doi.org/10.1177/027623661773382>
- Watkins, D., Cheng, C., Mpofu, E., Olowu, S., Singh-Sengupta, S., & Regmi, M. (2003). Gender differences in self-construal: How generalizable are western findings? *The Journal of Social Psychology*, 143(4), 501–519.
- Yilmaz, E., Phalet, K., & De Leersnyder, J. (2024). Acculturation of self-construal: First evidence from immigrant minorities in Belgium and the UK. *European Journal of Social Psychology*, 54(2), 529–544.
- Yu, Q., King, A. P., Yoon, C., Liberzon, I., Schaefer, S. M., Davidson, R. J., & Kitayama, S. (2021). Interdependent self-construal predicts increased gray matter volume of scene processing regions in the brain. *Biological Psychology*, 161, Article 108050. <https://doi.org/10.1016/j.biopsycho.2021.108050>
- Zhang, B., Fokkema, M., Cuijpers, P., Li, J., Smits, N., & Beekman, A. (2011). Measurement invariance of the center for epidemiological studies depression scale (CES-D) among Chinese and Dutch elderly. *BMC Medical Research Methodology*, 11(1), 1–10. <https://doi.org/10.1186/1471-2288-11-74>
- Zhang, W., Hung, I. T., Jackson, J. D., Tai, T. L., Goh, J. O. S., & Gutchess, A. (2020). Influence of culture and age on the self-reference effect. *Aging, Neuropsychology, and Cognition*, 27(3), 370–384.
- Zhu, Y., Zhang, L., Fan, J., & Han, S. (2007). Neural basis of cultural influence on self-representation. *Neuroimage*, 34(3), 1310–1316. <https://doi.org/10.1016/j.neuroimage.2006.08.047>