Journal of Education and Learning (EduLearn)
Vol. 19, No. 3, August 2025, pp. 1330~1340
ISSN: 2089-9823 DOI: 10.11591/edulearn.v19i3.22128

Dialectal migration's influence on ethnic cognitive processing and aesthetic tendency in Shandong, China

Du Jiaxin[1], Tan Wee Hoe[1,2], Dai Zetian[3]
[1]Faculty of Social Sciences and Liberal Arts, UCSI University, Kuala Lumpur, Malaysia
[2]International Institute of Science Diplomacy and Sustainability, UCSI University, Kuala Lumpur, Malaysia
[3]Department of environmental design, School of Art, Suzhou University of Science and Technology, Suzhou, China

Article Info

Article history:

Received Apr 17, 2024
Revised Jul 10, 2024
Accepted Aug 28, 2024

Keywords:

Aesthetic perception
Cultural identity
Cultural sustainability
Ethnic cognitive processing
Migration
Sustainable development

ABSTRACT

This study examines the impact of dialectal migration on cognitive processing and aesthetic tendencies across three major Shandong dialect groups: Heze, Jinan, and Jiaodong. The research highlights the interrelation between language evolution, ethnic identity, and sustainable cultural heritage in shaping memory, attention, and aesthetic preferences. Using three quasi-experiments, the study explores memory recall, attentional biases, and aesthetic evaluations. Results show enhanced memory and attentional biases toward one's ethnic group across all dialect groups, with Heze speakers displaying a significant affinity toward Henan people, influencing their aesthetic preferences. These findings emphasize the importance of language evolution and cultural identity in fostering sustainable development through the preservation of cognitive and aesthetic diversity. Future research should extend to other regions and ethnic groups to validate and expand these findings, thereby contributing to the discourse on cultural sustainability.

This is an open access article under the CC BY-SA license.

Corresponding Author:

Tan Wee Hoe
Faculty of Social Sciences and Liberal Arts, UCSI University
Taman Connaught, 56000 Kuala Lumpur, Kuala Lumpur Federal Territory, Malaysia
Email: tanwh@ucsiuniversity.edu.my

1. INTRODUCTION

Language significantly influences group cognition and ethnic identity, serving as both a cultural carrier and a core element of ethnic heritage [1]. It encapsulates the social dynamics, histories, and relationships among various ethnic groups, crucial for ethnic integration, and identity formation [2]–[4]. Studies have often neglected the impact of dialect variations within the same language, which are particularly pronounced in Chinese, where differences in pronunciation, vocabulary, sentence structure, and grammar can hinder communication between dialects such as Mandarin, Cantonese, Min Nan, and Shanghainese [5], [6]. Reflecting China's vast diversity and complex history, each dialect carries unique phonetic, grammatical, and lexical characteristics, deeply embedded within distinct cultural and historical contexts [7]. This study explores how speakers of Heze, Jinan, and Jiaodong dialects process information and aesthetic preferences (AP) related to their own and other ethnic groups, emphasizing the intricate relationship between language, culture, and regional identity. The findings will benefit researchers in cognitive science and linguistics, educators developing culturally inclusive curricula, and policymakers focused on cultural preservation and language planning.

Understanding the intricate relationship between ethnic groups, language, and art is crucial for analyzing the cognitive and aesthetic impacts of dialectal migration. This section delves into how ethnic identities are maintained and expressed through language and art, and how dialectal variations have evolved in the Shandong region of China. By examining the historical and cultural contexts of ethnic groups and their

dialects, we can better comprehend the role of language evolution in shaping ethnic cognitive processing and aesthetic tendencies.

Ethnic group-language–art: ethnic groups arise from the dynamics between different cultural entities or from smaller communities assimilating into larger ones, distinguished by a rich array of historical, linguistic, religious, and cultural traits that set them apart from national identities [8], [9]. According to ethnic boundary theory, these groups define themselves through interactions that are either inclusive or exclusive, creating a distinct sense of "us" versus "them" through specific cultural actions and traits [10]. In Chinese historical context, ethnic identities are viewed as fluid, evolving through active engagement with cultural and ancestral influences, which underscores the impact of mutable boundaries [11], [12]. Language and art play indispensable roles in maintaining these ethnic boundaries; languages and dialects not only carry but also shape the cultural, historical, and social narratives of a community, while art encapsulates ethnic histories and traditions, reflecting and transmitting the collective emotions and wisdom of its people [13], [14]. Both are significantly shaped by the migrations and cultural shifts within communities, suggesting that the appreciation and creation of art are influenced by the cultural habits brought by ethnic migrations.

Three major Chinese dialects in Shandong, China: against the backdrop of language evolution, immigrant groups often introduce their dialects and cultures, which interact and impact the existing cultures and languages of new environments. In Shandong, China, three main Han Chinese dialects are Jilu Mandarin (JLM), Jiaodong Dialect (JDD), and Luxinan Dialect (LXD) [15]. These dialects originated from the Central Plains area's Han migration, preserving some Central Plains Mandarin (CPM) features while developing unique linguistic traits [16]. Comparing these dialects, LXD is closest to CPM, followed by JLM, with JDD showing the most significant differences [15]. The timing of language variation indicates that JDD diverged from CPM the latest, and JLM the earliest [17]. The development and evolution of these dialects reflect historical migration patterns and demonstrate cultural and linguistic exchanges between different regions as shown in Table 1.

Table 1. Relationship between dialects, ethnic groups, and regions

Dialect characteristics	JLM	JDD	LXD	CPM
Representative ethnic groups	Jinan people	Jiaodong people	Heze people	Henan people
Representative regions	Jinan	Jiaodong	Heze	Henan
Meaning	After the migration, it is somewhat close to CPM	After the migration, it is least close to CPM	After the migration, it is closest to CPM	The ancestral roots of the Chinese national language

2. STUDY-1

To determine the impact of dialect evolution on ethnic group information memory, this study employed a group reference R/K paradigm. Henan people, representing the Central Plains ethnic group, and Chinese Koreans, serving as a control group for our ethnic group, were chosen due to Henan's historical significance as the cradle of Huaxia civilization and culture. If dialect evolution and ethnic/dialect names affect group reference, an interaction between dialect groups and reference groups is expected. Specifically, the three dialect groups should show inconsistent processing coefficients under different ethnic references. Heze people's memory performance under the Henan people reference should be better than under the Chinese Korean reference, while Jinan people's performance should show no significant difference or a smaller difference under both references.

2.1. Participants

90 Han Chinese undergraduates, 30 each from Heze people, Jinan people, and Jiaodong people, all speaking their respective dialects. Aged 17-23, with an average age of 20.6 years, the participants were balanced in gender, proficient in Mandarin (level 2 or higher), natives of Shandong, and had similar living environments, academic abilities, and educational levels. All had normal or corrected vision and were right-handed.

2.2. Research design

A 3×3 factorial design was used in Study 3, featuring three dialect groups: LXD speakers, JLM speakers, and JDD speakers. Additionally, the design included three reference groups: participants' own dialect group, Henan people, and Chinese Koreans. In this design, the dialect group served as a between-subjects variable, while the reference group was treated as a within-subjects variable.

2.3. Experimental materials

180 medium-frequency personality adjectives (half positive, half negative) were selected from the Modern Chinese Frequency Dictionary. During the learning phase, 120 bipolar adjectives (half positive, half negative) were randomly drawn and paired with three ethnic groups, forming 20 adjective pairs for each of the six combinations. During the recognition phase, 10 adjective pairs from each group were randomly selected, resulting in 60 studied bipolar adjectives (half positive, half negative) and 60 unstudied bipolar adjectives, matched for word frequency and number of strokes. Thirty homogeneous subjects rated the valence of the words on a 7-point scale (1=very negative, 7=very positive).

As Table 2 showed that during the learning phase, there were no significant differences in writing time between the two groups of words, $t(118)=1.60$, $p=0.112$, and no significant differences in average word frequency, $t(118)=0.275$, $p=0.784$. A t-test of the adjusted valence values (the absolute value of the median "4" minus the original valence) for positive and negative words showed no significant difference in average valence, $t(118)=1.34$, $p=0.794$. In the recognition phase, there were no significant differences in average number of strokes, $t(118)=0.16$, $p=0.871$, and no significant differences in average word frequency, $t(118)=0.86$, $p=0.591$. The difference in average valence between positive and negative words was also not significant, $t(118)=1.46$, $p=0.621$.

Table 2. Attributes of personality adjectives

Experimental process	Adjective type	Examples	Writing time	Character frequencies	Part of speech valence
Learning phase	Positive	Rectitude	4.08 (0.54)	156.45 (78.36)	5.33 (1.32)
	Negative	Stubborn	3.96 (0.28)	156.33 (71.32)	3.67 (0.95)
Validation phase	Positive	Steady	4.04 (0.34)	162.33 (86.41)	5.48 (1.63)
	Negative	Rude	3.88 (0.27)	153.57 (68.34)	3.32 (0.73)

2.4. Stimuli and procedure

Study-1's experimental procedure consisted of three phases: learning, distraction, and validation. In the learning phase, participants were shown a fixation point, followed by a question asking whether a personality trait word suits their ethnic group, Henan people, or Chinese Koreans. Participants answered by pressing Y for "yes" and N for "no." This phase included 120 randomized trials. In the distraction phase, participants performed a pen-and-paper task to prevent rehearsal. They wrote down 13 letters of the alphabet in uppercase, skipping every other letter, for 1 minute.

During the validation phase, participants were introduced to the meanings of R and K. After understanding the instructions, they completed 4 practice rounds and then proceeded to the main experiment. Each trial started with a fixation point, followed by a blank screen, and then a personality trait adjective. Participants pressed M if they believed the word was not presented during the learning phase, or C if they thought it was. If C was pressed, they made a remember/know judgment: pressing R if they recalled specific details about the item, or K if they only felt it was familiar without recalling details. This phase lasted approximately 15 minutes as shown in Figure 1.

2.5. Results and analysis

In Study-1, the overall recognition rate of participants was above 10%, making all data suitable for analysis. The results for the validation phase, R, and K scores are presented in Table 3. The analysis of corrected validation scores (hit percentage minus false alarm percentage) showed no significant main effect for dialect groups, $F(2.87)=0.57$, $p=0.567$. There was a significant main effect for reference groups, $F(2.174)=23.71$, $p<0.001$, $\eta p^2=0.21$. Scores when referencing one's own ethnic group ($M=0.76$) were significantly higher than those when referencing Chinese Korean ($M=0.67$) and Henan people ($M=0.67$). No significant interaction was found between dialect groups and reference groups, $F(4.174)=1.44$, $p=0.224$.

The variance analysis of R corrected scores (hit percentage minus false alarm percentage) revealed that the main effect of dialect groups was not significant, $F(2.87)=0.13$, $p=0.875$. However, there was a significant main effect for reference groups, $F(2.174)=29.02$, $p<0.001$, $\eta_p^2=0.25$. The mean comparison indicated that scores when referencing one's own ethnic group ($M=0.48$, 95% CI [0.43, 0.53]) were significantly higher than those for Korean ($M=0.37$, 95% CI [0.32, 0.42]) and Henan people ($M=0.38$, 95% CI [0.33, 0.43]), $p_s<0.001$. The interaction effect between dialect groups and reference groups was significant, $F(4.174)=2.50$, $p=0.045$, $\eta p^2=0.05$.

A simple effects analysis revealed that LXD speakers demonstrated a hierarchical effect in memory performance across different reference groups. Specifically, scores when referencing their own ethnic group ($M=0.46$, 95% CI [0.36, 0.55]) were significantly higher than those referencing Henan people ($M=0.40$, 95%

CI [0.31, 0.49]), p=0.017, and scores referencing Henan people were significantly higher than those referencing the unrelated group (M=0.35, 95% CI [0.26, 0.44]), p=0.050.

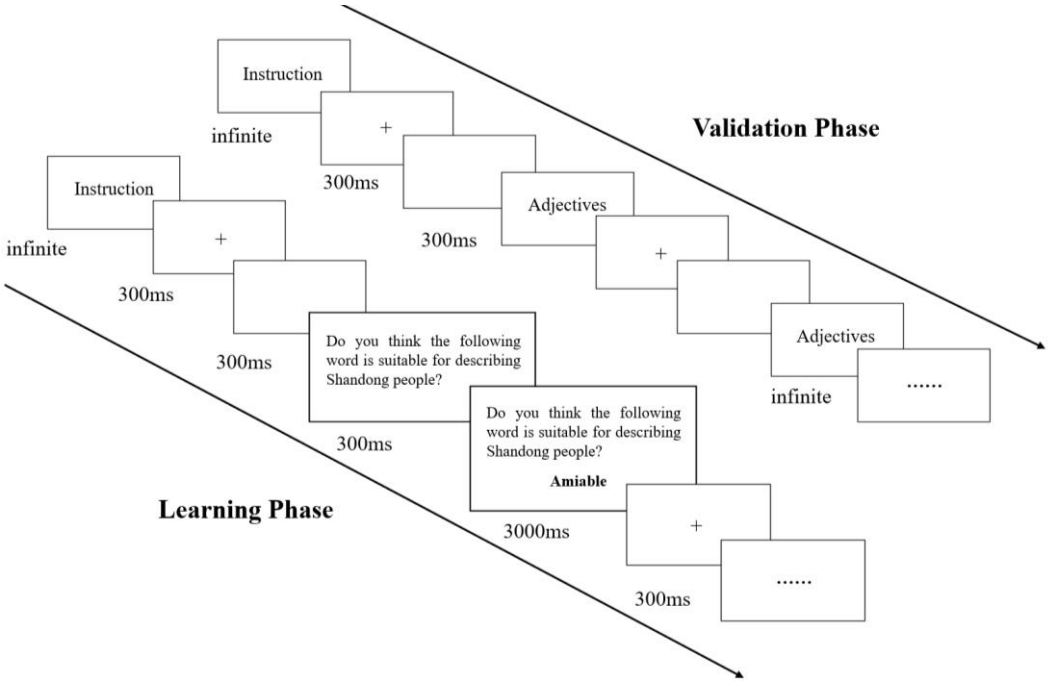

Figure 1. Procedure of experiment 1

Table 3. Recognition rate and memory type

Subject	Reference condition	Memory type		
		Validation	R	K
LXD speaker	Heze people (own ethnic group)	0.74 (0.14)	0.45 (0.25)	0.30 (0.23)
	Henan people (Central Plains)	0.64 (0.18)	0.40 (0.24)	0.33 (0.19)
	Chinese Korean (unrelated ethnic group)	0.66 (0.20)	0.35 (0.22)	0.28 (0.17)
JLM speaker	Jinan people (own ethnic group)	0.76 (0.14)	0.46 (0.25)	0.29 (0.15)
	Henan people (Central Plains)	0.73 (0.14)	0.35 (0.22)	0.30 (0.21)
	Chinese Korean (unrelated ethnic group)	0.70 (0.18)	0.38 (0.24)	0.35 (0.20)
JDD speaker	Jiaodong people (own ethnic group)	0.76 (0.20)	0.53 (0.24)	0.23 (0.15)
	Henan people (Central Plains)	0.67 (0.14)	0.38 (0.22)	0.26 (0.16)
	Chinese Korean (unrelated ethnic group)	0.65 (0.14)	0.37 (0.21)	0.24 (0.14)
	F	0.57	29.02	24.31
	η^2	0.21	0.25	0.27
	P	0.57	***	0.37

***p<0.001

2.6. Discussion of Study-1

The R score serves as a robust indicator of self-referential processing consolidation, as supported by prior research [18], [19]. Findings from experiment 1 reveal that all three dialect groups exhibited enhanced memory performance when referencing their own group, which demonstrates an in-group reference effect. Additionally, compared to Jinan and Jiaodong people, Heze people showed superior memory for information about the Henan ethnic group, representing the Central Plains, thereby indicating an ancestral language group reference effect.

3. STUDY-2

Heze residents, with strong ancestral ties to the Central Plains scholarly class, may exhibit an attentional bias towards information related to the Central Plains ethnic group. Attentional bias involves heightened sensitivity to particular stimuli and selective attention [20], such as increased focus on emotionally

charged over neutral stimuli [21]. There are two forms of attentional bias: attentional vigilance, where individuals remain alert to potentially significant negative stimuli [22], [23], and difficulty disengaging, seen in prolonged attention to specific body images in individuals dissatisfied with their bodies [24].

In Study-2, participants were primed with names of ethnic groups local Henan people (Central Plains), Korean Koreans (unrelated group), or no priming before judging the color of words. This study tests if dialect and ethnic names influence attention to ethnic information. It is hypothesized that Heze participants will show slower response times and reduced accuracy in color judgment under Henan priming compared to the unrelated Korean priming, suggesting an attentional bias not seen in participants from Central Shandong like Jinan.

3.1. Participants

Ninety Han Chinese university students participated in the study, divided equally among Heze people, Jinan people, and Jiaodong people, with each group having 30 participants. Their dialect was restricted to their respective local dialects. The age range was between 17 and 28 years old, with an average age of 25.2 years. The group consisted of 42 males and 48 females, all of whom had a proficiency in Mandarin Chinese of at least Level 2 Grade B. All participants were natives of Shandong Province, had always studied in Shandong, and had taken the college entrance examination there. They were matched in terms of living environment, learning ability, and educational level. All had normal vision or corrected-to-normal vision, and were right-handed. Importantly, none of them had participated in Study-1.

3.2. Research design

Study-2 was structured using a 3×4×3 mixed factorial design, incorporating three main variables: dialect groups (LXD speakers, JLM speakers, JDD speakers) as a between-subjects factor, and both priming group names (PGN) (local ethnic group name, Henan people, Chinese Korean, no prime) and valence of personality trait words (negative, positive, neutral) as within-subjects factors. The stimuli included names of different ethnic groups for priming and categorized target words consisting of 88 positive adjectives, 88 negative adjectives, and 88 unrelated descriptive words about the environment and scenery, distributed evenly across the priming conditions with 21 words used in the formal experiments and one for practice. These were presented against a white background in bold font at the center of the screen. To ensure familiarity, participants were shown these words on paper before the experiment began. The frequency and writing time of these Chinese character groups were carefully matched as shown in Table 4.

Table 4. Target word information in Study-2

Target word	Examples	Writing time	Character frequencies	Linguistic prestige
Positive adjective	Industrious	3.85 (0.38)	176.71	4.89
Negative adjective	Lazy	4.03 (0.23)	168.23	4.03
Unrelated word	brightness	3.97 (0.47)	173.33	4.11

The results indicated that there was no significant difference in the writing time for the three groups of Chinese characters, $F(2.261)=5.33$, $p=0.78$; there was also no significant difference in average word frequency, $F(2.261)=6.20$, $p=0.85$. The valence values for positive and negative adjectives were adjusted (the absolute value of the median valence "4" minus the original valence value) and tested with a t-test, revealing no significant difference in average valence between positive and negative words, $t(174)=1.16$, $p=0.51$. A variance analysis comparing the average valence values of positive and negative adjectives with unrelated words showed no significant difference, $F(2.261)=2.10$, $p=0.40$.

3.3. Experimental procedure

Study-2 was developed using E-Prime and conducted on a Pentium 4 computer. As shown in Figure 2, the procedure began with a fixation point "+" displayed for 300 ms, followed by either a black prime word (ethnic group name) or a blank screen for 600 ms, then a blank screen for 500 ms. Subsequently, the target word appeared in red, green, or blue for 400 ms, followed by a 3000 ms blank screen. Participants had to identify the word's color within 3000 ms by pressing the Q, P, or spacebar keys (labeled red, green, or blue respectively) using their left and right index fingers and right thumb. The computer tracked response times and accuracy across 252 randomized trials. Before the main experiment, participants completed 12 practice trials with non-experimental materials as shown in Figure 2 and Table 5.

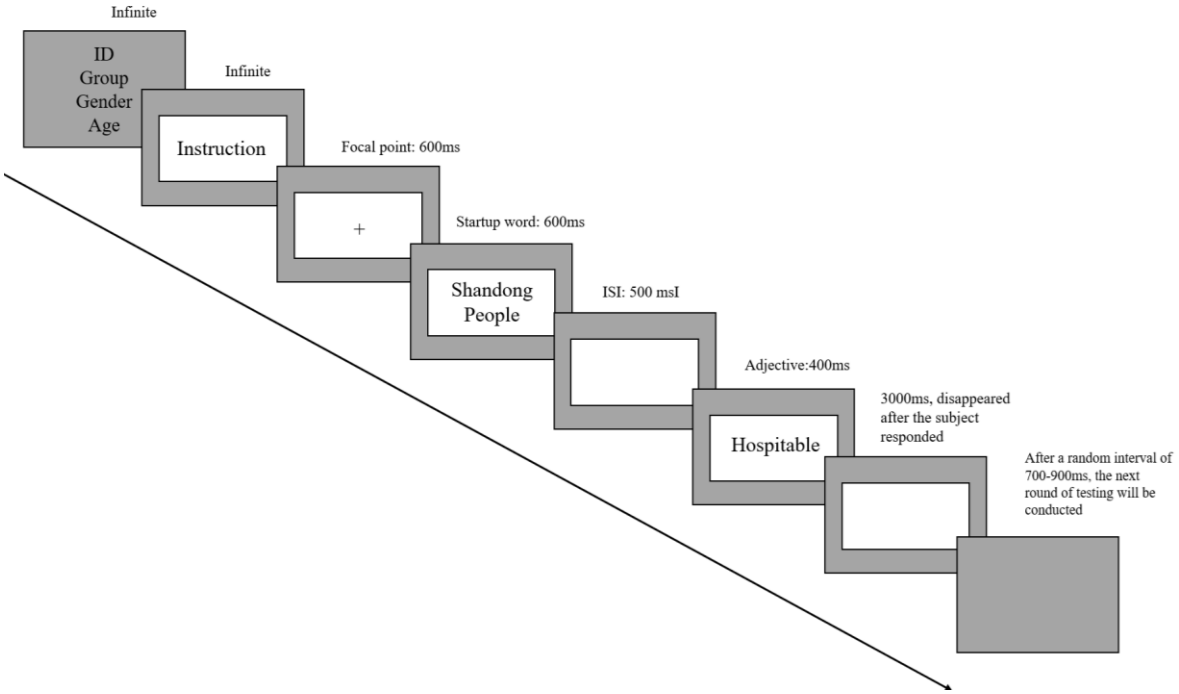

Figure 2. Process of experiment in Study-2

Table 5. Prime words response time and error rate

Subject type	Prime words	Target word: Positive adjectives		Negative adjectives		Unrelated word	
		Response time	Error rate	Response time	Error rate	Response time	Error rate
LXD speaker	Heze people (own ethnic group)	1032 (459)	2.14 (4.36)	1054 (448)	1.92 (4.05)	1036 (458)	1.81 (3.06)
	Henan people (Central Plains)	823 (257)	1.79 (3.46)	808 (227)	3.08 (4.64)	816 (227)	2.11 (3.51)
	Chinese Korean (unrelated ethnic group)	635 (148)	3.22 (4.83)	623 (137)	3.40 (6.50)	628 (142)	2.77 (4.38)
	No prime words	624 (170)	2.42 (3.89)	620 (164)	2.28 (3.51)	640 (161)	2.79 (4.87)
JLM speaker	Jinan people (own ethnic group)	926 (354)	1.59 (2.22)	910 (338)	2.31 (2.92)	931 (353)	2.05 (3.09)
	Henan people (Central Plains)	625 (105)	2.82 (1.01)	627 (108)	2.81 (3.62)	634 (108)	2.59 (4.68)
	Chinese Korean (unrelated ethnic group)	623 (115)	1.69 (2.72)	622 (101)	1.78 (3.20)	635 (125)	2.82 (3.85)
	No prime words	624 (100)	2.29 (3.32)	525 (103)	1.69 (2.72)	639 (124)	1.18 (2.51)
JDD speaker	Jiaodong people (Own ethnic group)	910 (243)	1.25 (1.03)	904 (225)	2.68 (3.39)	933 (241)	3.64 (2.72)
	Henan people (Central Plains)	574 (143)	2.28 (2.71)	580 (147)	2.02 (6.20)	591 (154)	3.26 (5.12)
	Chinese Korean (unrelated ethnic group)	578 (156)	3.31 (2.51)	574 (156)	2.44 (4.81)	588 (157)	2.49 (5.84)
	No prime words	576 (172)	3.32 (4.21)	582 (148)	1.93 (4.30)	588 (154)	2.43 (5.39)

Note: the unit of response time is ms and the average error rate is percentage

3.4. Results and discussion

The analysis of variance for response time indicated that under priming conditions, the main effect of dialect group was significant, $F(2.87)=3.21$, $p=0.049$, $\eta p2=0.07$. The response time of LXD speakers (M=815 ms, 95% CI [748, 883]) was significantly longer than that of JDD speakers (M=701 ms, 95% CI [634, 769]), $p=0.020$, and marginally significantly longer than that of JLM speakers (M=726 ms, 95% CI [659, 794], $p=0.067$; no significant difference in response time was found between JDD speakers and JLM speakers,

p=0.599. The main effect of PGN was significant, F(2.174)=88.27, p<0.001, η_p^2=0.50. Response times were significantly longer for own group name priming (M=959 ms, 95% CI [885, 1034]) than for Henan people priming (M=672 ms, 95% CI [636, 708]) and Chinese Korean priming (M=611 ms, 95% CI [584, 639]), with response times for Henan people priming significantly longer than for Chinese Korean priming, p_s<0.001. The interaction between dialect group and PGN was significant, F(4.174)=2.71, p=0.032, η_p^2=0.06. All other main effects and interactions were not significant, p_s>0.05. Under no priming conditions, all main effects and interactions were not significant, p_s>0.05.

Secondly, the analysis for JLM speakers showed that the main effect of PGN was significant, F(2.58)=23.41, p<0.001, η_p^2=0.45. Response times were significantly longer for own group name priming (M=922 ms, 95% CI [794, 1051]) than for Henan people priming (M=626 ms, 95% CI [587, 665]) and Chinese Korean priming (M=631 ms, 95% CI [590, 672]), p_s<0.001; no significant difference in response time was observed between Henan people priming and Chinese Korean priming, p=0.467. All other main effects and interactions were not significant, p_s>0.05.

Lastly, the analysis for JDD speakers revealed that the main effect of PGN was significant, F(2.58)=53.54, p<0.001, η_p^2=0.65. Response times were significantly longer for own group name priming (M=932 ms, 95% CI [842, 1021]) than for Henan people priming (M=586 ms, 95% CI [532, 641]) and Chinese Korean priming (M=585 ms, 95% CI [528, 643]), p_s<0.001. No significant difference in response time was found between Henan people priming and Chinese Korean priming, p=0.888. All other main effects and interactions were not significant, p_s>0.05. Additionally, the analysis of variance for error rates showed that all main effects and interactions were not significant, p_s>0.05.

4. STUDY-3

Building on prior research, it's clear that language evolution significantly impacts memory for ethnic group information, enhancing recall for one's own ethnic group while reducing it for others. This memory bias may extend beyond text to visual arts. Ross [25] highlighted that language and writing are crucial to cultural and artistic development, emphasizing the importance of cultural heritage in diverse forms. Treichl [26] suggested that visual arts merge and extend language and culture. Similarly, Tversky and Chow [27] and Crow [28] noted that language and cultural differences influence visual arts, which in turn reflect these elements. Therefore, we hypothesize that the memory bias for one's own ethnic language and writing might also manifest as an AP for visual arts characteristic of one's ethnic culture, leading individuals to show a stronger aesthetic inclination towards art that reflects their own ethnic identity.

Study-3 is based on the aesthetic processing model proposed by Reber *et al.* [29], which explains that AP are triggered by the fluency with which a perceiver processes an object [30]. This model, through extensive replication experiments, is considered one of the golden standards for explaining aesthetic mechanisms [31]–[33]. Since visual art is considered an extension of language and writing [26]–[28], we propose that Heze people, who regard Henan people as their ancestral ethnic group, may have an aesthetic bias towards them. Conversely, no aesthetic bias is expected towards an unrelated ethnic group (Chinese Korean). Therefore, it is hypothesized that PGN are a moderating variable affecting the impact of subjective beauty fluency (SBF) on AP (see Figure 3).

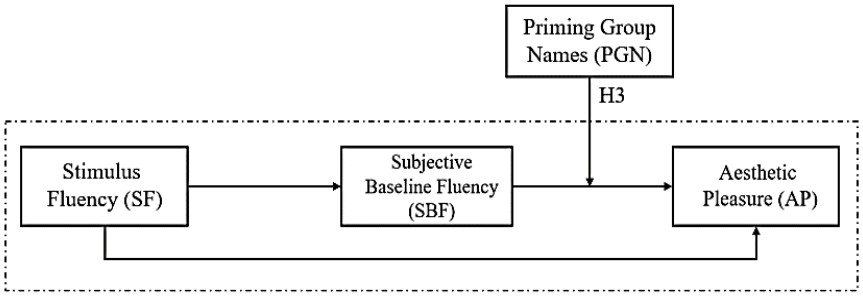

Figure 3. Hypothesis model of Study-3

4.1. Participants

The study involved 180 participants, all belonging to Heze people. Their dialect was strictly limited to their own ethnic group, and all were from Shandong province. Only 9 of them had a history of living in other

provinces or cities, but none for more than a month. None of the participants had taken part in Study-1 or Study-2.

4.2. Research materials

To avoid the direct influence of the painting subject on aesthetic bias, researchers selected a batch of AI-generated surreal digital paintings from the Sanbate online gallery. Referencing the research results of Graf and Landwehr [32], 267 participants rated the fluency perception of these paintings using a 5-point Likert scale, scoring the fluency of 86 abstract paintings. Finally, artworks with high consistency (α=0.89) were selected (see Figure 4).

Figure 4. Sample stimuli of Study-3 [33]

4.3. Research design

Study-3 also used the E-Prime programming system. Participants were informed beforehand that the abstract paintings were used to describe the characteristics and customs of the area represented by the prime word (ethnic group names). First, a "+" fixation point was presented in the center of the screen for 300 ms, followed by a prime word (ethnic group name) or black screen for 600 ms, a blank screen for 500 ms, and then an abstract painting was quickly presented for 400 ms, followed by a blank screen for 3000 ms. Half of the displayed abstract paintings were randomly assigned to follow the Central Plains ethnic group (Henan people), and the other half followed a Different ethnic group (Chinese Korean). After all tests were completed, participants were instructed to fill out a questionnaire about the aesthetic pleasure they experienced from the abstract paintings shown.

4.4. Result and discussion

As shown in Table 6, the main effect of subjective fluency (SF) on AP was significant, F=105.695, p<0.001, R2=0.349. As SF increased, AP also increased, indicating a statistically significant positive effect of SF on AP. On the other hand, as shown in Table 7, SBF played a mediating role in the entire regression equation, with an indirect effect of 0.768, CI=[0.543, 1.534], p<0.001. SBF had a very significant positive effect on AP in the process of influence, F=26.765, β=0.367, p<0.001, thus reaffirming that AP are triggered by the fluency with which a perceiver processes an object.

Table 6. Main effect test (SF—AP)

SF	Coeff	se	t	P	LLCI	ULCI
Constant	4.104	0.189	18.695	0.000	1.356	3.279
SF	1.007	0.133	7.481	0.000	0.125	1.336
R^2	0.349					
F	105.695					

Note: LLCI: lower-level confidence interval; ULCI: upper-level confidence interval

Table 7. Indirect effects-direct effects-total effect

Effect type	Effect	se	t	P	LLCI	ULCI
Total	1.332	0.272	18.464	0.000	1.358	2.283
Direct	0.768	0.160	4.810	0.000	0.543	1.534
Indirect	0.872	0.140	/	/	0.738	1.089

As shown in Table 8, the mediated model with moderating variables was highly significant, with an effect size of 0.156, SE=0.047, CI=[0.155, 0.310]. When the Central Plains ethnic group (Henan people) served as the PGN, Heze people showed an AP for abstract paintings with high fluency, with a simple slope of 0.761, SE=0.104, p<0.001. Conversely, when different ethnic groups (Chinese Korean) served as PGN, the negative AP was not statistically significant, with a simple slope of -0.026, SE=0.108, p=0.677. Therefore, it can be concluded that Heze people, who regard Henan people as their ancestral ethnic group, have an aesthetic bias towards them.

Table 8. Intermediary tests with moderation

PGN	Effect	Boot SE	LLCL	ULCL
Central Plains ethnic group (Henan people)	0.156	0.047	0.064	0.248
Different ethnic groups (Chinese Korean)	-0.068	0.047	-0.033	0.456

5. DISCUSSION

This study investigated the effects of dialectal migration on ethnic cognitive processing and aesthetic tendencies. The result shows that all three dialect groups exhibited memory advantages and attentional biases for information related to their own ethnic group. Among them, LXD speakers (Heze people) displayed memory advantages and attentional biases towards the Central Plains ethnic group represented by Henan people, while JLM speakers and JDD speakers did not show such patterns. Additionally, when abstract paintings replaced adjectives, Heze people also showed an aesthetic bias towards abstract paintings classified as belonging to the Central Plains ethnic group.

5.1. Self-cognition processing of own ethnic group

The self includes three representations: individual self, collective self, and relational self [34]. The individual self is at the core of the self, and the collective self is an extension and expansion of the individual self. The influence of the collective self on memory can be manifested through the group-reference effect when the reference object belongs to one's own group, memory for related materials is better than semantic processing, even producing advantages equivalent to self-reference processing. Experiment 1 found that all three dialect groups exhibited a group-reference effect for their own ethnic group, showing the best memory effects when information was related to their own ethnic group.

All three ethnic groups displayed attentional biases towards their own ethnic group's information in immediate processing. Priming with their ethnic group's name led to increased cognitive resources for semantic processing, impacting the judgment of adjective colors. This bias, encompassing alertness, avoidance, and disengagement difficulty, applied to both positive and negative words. Such biases are typically directed towards negative stimuli but can also occur with positive stimuli.

5.2. Ancestral attachment of Heze people to the Central Plains ethnic group

Heze city, located at the junction of Shandong and Henan, shares closer linguistic and cultural ties with the Central Plains due to its geographical location and dialectal features. This proximity likely influences Heze people's cultural identity and ethnic sentiment. The Luxinan Dialect's similarity to CPM and cultural preservation in Heze could resonate with traditional customs, festivals, and culinary habits of the Central Plains. Additionally, as language plays a crucial role in cultural identity, the daily use of their dialect may reinforce Heze people's connection to Central Plains culture, maintaining a sense of ancestral roots with the Central Plains ethnic group.

5.3. Limitations

This study focused on three major dialect groups in Shandong, and the findings may not be generalizable to other regions or ethnic groups. Further research is needed to explore these dynamics in other areas and among different ethnic groups to confirm the broader applicability of these results. Additionally, while the study employed rigorous experimental methods, future studies could incorporate more diverse and larger samples to enhance the robustness of the findings.

5.4. Summarizing key findings

We found that speakers of Heze, Jinan, and Jiaodong dialects exhibited enhanced memory and attentional biases towards their own ethnic group information. Specifically, Heze speakers showed significant biases towards Henan people, which influenced their AP in visual arts. This indicates that dialectal migration and ethnic ties significantly affect cognitive processing and aesthetic tendencies.

The study suggests that ethnic identity and language evolution play crucial roles in cognitive processing. This is consistent with previous research findings that highlight the group-reference effect and the influence of the collective self on memory. Compared to Jinan and Jiaodong speakers, Heze speakers demonstrated a stronger connection to the Central Plains ethnic group, reflecting their deeper ethnic consciousness and identity. This may be attributed to the linguistic and cultural ties Heze maintains with the Central Plains.

6. CONCLUSION

The results indicate that names of ethnic groups and their dialects preserve an emotional link to ancestral languages, which is central to ancestral culture and vital for fostering a sense of community among ethnically related groups. This emotional connection, rooted in linguistic heritage, can enhance cohesive sentiments within a national community, influencing cognitive processing and AP. Compared to prior studies focusing on broad linguistic differences, our research illuminates the specific impact of dialectal variations on memory and aesthetic biases.

Despite the insights gained, the study has limitations, such as the specific focus on Shandong dialect speakers and the scope confined to memory and AP. Future research should investigate the effects of dialectal variations on other cognitive domains, like decision-making and emotional processing. Additionally, exploring the impact of modern linguistic shifts on traditional cultural identities could provide a deeper understanding of the dynamic interplay between language evolution and ethnic identity.

REFERENCE

[1] D. L. Everett, *Language: The cultural tool*. Vintage, 2012.
[2] A. Seiferle-Valencia, *An analysis of Franz Boas's race, language and culture*. Macat Library, 2017, doi: 10.4324/9781912128266
[3] A. Heith, *Aesthetics and ethnicity: the role of boundaries in Sámi and Tornedalian art*, Whiteness and postcolonialism in the Nordic region, Routledge, pp. 159-173, 2016.
[4] K. A. Noels, "Language variation and ethnic identity: a social psychological perspective," *Language & Communication*, vol. 35, pp. 88-96, 2014, doi: 10.1016/j.langcom.2013.12.001.doi.org/10.1016/j.langcom.2013.12.001.
[5] R. Dodsworth, "Migration and dialect contact," *Annual Review of Linguistics*, vol. 3, pp. 331-346, 2017.
[6] C. N. Li, S. A. Thompson, *Chinese*. The major languages of East and South-east Asia, Routledge, pp. 83-105, 2022.
[7] J. Zhu, T. N. Grigoriadis, "Chinese dialects, culture & economic performance," *China Economic Review*, vol. 73, pp. 101783, 2022, doi: 10.1016/j.chieco.2022.101783.
[8] K. Hamer *et al.*, "What is an "ethnic group" in ordinary people's eyes? different ways of understanding it among American, British, Mexican, and polish respondents," *Cross-Cultural Research*, vol. 54, no. 1, pp. 28-72, 2020, doi: 10.1177/1069397118816939.
[9] P. R. Brass, *Ethnic groups and the state*. Routledge, pp. 1-56, 2023.
[10] F. Barth, *Introduction to ethnic groups and boundaries: the social organization of cultural difference*, Selected studies in international migration and immigrant incorporation, vol. 1, pp. 407, 2010.
[11] M. Kurpaska, *Chinese language(s): a look through the prism of the great dictionary of modern Chinese dialects*, De Gruyter Mouton, 2010.
[12] A. J. Umaña-Taylor, *Ethnic identity*, In: Schwartz, S., Luyckx, K., Vignoles, V. (eds) Handbook of Identity Theory and Research. Springer, New York, NY, pp. 791-809, 2011, doi: 10.1007/978-1-4419-7988-9_33.
[13] J. Joseph, *Language and identity: National, ethnic, religious*. Springer, 2004.
[14] W. Shearer, and J. A. Matisoff, *An encyclopedia of the 140 languages of China: speakers, dialects, linguistic elements, script and distribution*. Edwin Mellen Press, 2017.
[15] X. Q. Chen, "A new exploration on the evolution types and paths of Shandong three-tone dialects (in Chinese)," *Modern Chinese*, vol. 3, no. 07, pp. 21-27, 2023.
[16] Y. J. Chen, "The complexity of liao 'finish' and its weakened form le in the Shangshui dialect of Central Plains Mandarin, Henan Province," *International Journal of Chinese Linguistics*, vol. 2, no. 1, pp. 57-84, 2015.
[17] T. Wei, "Phonetic Research of Jiaonan Dialect in Shandong Province," Master's Thesis. Tianjin Normal University, 2023.
[18] D. C. Rubin, *Beginnings of a theory of autobiographical remembering*. Autobiographical memory, Psychology Press, pp. 47-67, 2014.
[19] M. A. Conway, L. V. Justice, A. D' Argembeau, "The self-memory system revisited," *The organization and structure of autobiographical memory*, pp. 28-51, 2019.
[20] R. J. Mc Nally, "Attentional bias for threat: crisis or opportunity?" *Clinical Psychology Review*, vol. 69, pp. 4-13, 2019, doi: 10.1016/j.cpr.2018.05.005.
[21] J. Sveen, J. Dyster-Aas, M. Willebrand, "Attentional bias and symptoms of posttraumatic stress disorder one year after burn injury," *The Journal of Nervous and Mental Disease*, vol. 197, no. 11, pp. 850-855, 2009, doi: 10.1097/NMD.0b013e3181bea555.
[22] Y. G. Qin, "Features of alert attention in visual stimulus detection," Doctoral dissertation. Southwest University, 2012.
[23] W. H. Miltner, S. Krieschel, H. Hecht, R. Trippe, and T. Weiss, "Eye movements and behavioral responses to threatening and nonthreatening stimuli during visual search in phobic and nonphobic subjects," *Emotion*, vol. 4, no. 4, pp. 323-339, 2004, doi: 10.1037/1528-3542.4.4.323.
[24] D. Wang, T. Wang, S. Qin, and J. Zhang, "Location effect of Chinese wordable components in the component priming paradigm," *Acta Psychologica Sinica*, vol. 51, no. 2, pp. 163-176, 2019, doi: 10.3724/SP.J.1041.2019.00163.
[25] L. Ross, *Language in the visual arts: the interplay of text and imagery*. McFarland, 2014.
[26] C. Treichl, *Art and language: explorations in (post) modern thought and visual culture*, Kassel University Press GmbH, 2017.
[27] B. Tversky, and T. Chow, "Language and culture in visual narratives," *Cognitive Semiotics*, vol. 10, no. 2, pp. 77-89, 2017, doi: 10.1515/cogsem-2017-0008
[28] D. Crow, *Visible signs: an introduction to semiotics in the visual arts*, Bloomsbury Publishing, 2022.

[29] R. Reber, N. Schwarz, and P. Winkielman, "Processing fluency and aesthetic pleasure: is beauty in the perceiver's processing experience?" *Personality and Social Psychology Review*, vol. 8, no. 4, pp. 364-382, 2004, doi: 10.1207/s15327957pspr0804_3.
[30] R. Reber, "Processing fluency, aesthetic pleasure, and culturally shared taste," *Aesthetic science: Connecting minds, brains, and experience*, pp. 223-249, 2012.
[31] T. Chenier, and P. Winkielman, "The origins of aesthetic pleasure: processing fluency and affect in judgment, body, and the brain," *Neuroaesthetics, Routledge*, pp. 275-289, 2018.
[32] L. K. Graf, and J. R. Landwehr, "Aesthetic pleasure versus aesthetic interest: the two routes to aesthetic liking," *Frontiers in Psychology*, vol. 8, pp. 217446, 2017.
[33] San Base. Gallery. Retrieved from http://sanbase.com/gallery.html, 2024.
[34] Z. Dai, T. W. Hoe, S. Wang, and J. Xue, "Tactile perception in aesthetic evaluation: a systematic review," *Journal of Aesthetic Education*, vol. 57, no. 4, pp. 98-124, 2023, doi: 10.5406/15437809.57.4.06.

BIOGRAPHIES OF AUTHORS

Du Jiaxin is a Ph.D. candidate at UCSI University, specializing in the application of gamification teaching in fashion design. Her research interests lie at the intersection of technology, design, and education, and she is engaged in interdisciplinary educational research that draws on theories and practices from a range of fields. She can be contacted at email: 1002165040@ucsiuniversity.edu.my.

Tan Wee Hoe is the chief editor for International Journal of Game-Based Learning (IJGBL). The professor and the Head of Research and Postgraduate Studies at the Faculty of Social Sciences and Liberal Arts in UCSI University, Malaysia. He received a Ph.D. in Education, specializing in game-based learning from University of Warwick. He began working between the creative industry and the academia, facilitating university-industry collaboration in Malaysia, UK, and US. Before the COVID-19 pandemic, he was a Visiting Faculty at SUTD Game Lab, Singapore, a Hubert H. Humphrey Fellow at the Penn State College of Education. He can be contacted at email: tanwh@ucsiuniversity.edu.my.

Dai Zetian received the Ph.D. in UCSI University, the B.S. in Shandong College of Arts, M.S. degrees in Shandong University of Architecture and Engineering. He is currently studying focus on creativity, and following with Prof Tan Wee Hoe on creativity and game-based learning, creative thinking, and aesthetic perception. He can be contacted at email: daydzt@163.com.