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# Learning Styles, Brain Dominance, Emotional Intelligence, and Second Language Learning Motivation and Anxiety in Secondary Students

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A B S T R A C T

The present study aimed to determine the relationship between learning styles, brain quadrant dominance, and emotional intelligence with anxiety and enthusiasm for second language learning among male and female students in lower and upper secondary schools in Alborz Province. In terms of purpose, this research was applied, and in terms of data collection, it was descriptive and correlational in nature. The statistical population included all lower and upper secondary school students in Alborz Province during the 2023–2024 academic year. A multistage cluster sampling method was used to select the sample, and 300 students were ultimately chosen as participants. Data were collected using standardized questionnaires, including Kolb's Learning Styles Questionnaire (1985), Bradberry and Greaves' Emotional Intelligence Questionnaire (2004), Herrmann's Brain Dominance Instrument (1980), and Knowles et al.'s Second Language Learning Questionnaire (2000). The collected data were analyzed using inferential statistical methods, including correlation coefficients and multiple regression analysis, through SPSS version 26. The findings indicated that learning styles, brain quadrant dominance, and emotional intelligence had a significant negative relationship with amotivation in second language learning at the 0.05 significance level ($p < .05$). Furthermore, a significant positive relationship was found between learning styles, brain quadrant dominance, and emotional intelligence with both intrinsic and extrinsic motivation for second language learning at the same significance level ($p < .05$). In addition, the results showed that learning styles, brain quadrant dominance, and emotional intelligence respectively explained 68% of the variance in amotivation, 68% of the variance in intrinsic motivation, and 73% of the variance in extrinsic motivation for second language learning among students.

***Keywords:*** *Anxiety and enthusiasm for second language learning, Brain quadrant dominance, Learning styles, Emotional intelligence, Students*

## 1. Introduction

In recent decades, second language learning has become a major focus in language education and learning research. Given its growing importance, many studies have sought to identify methods and factors that can improve second language learning outcomes. A key line of inquiry has examined how learners' learning styles, brain quadrant dominance, and emotional intelligence relate to two common psychological experiences in language learning: anxiety and enthusiasm/engagement. Second language learning is an essential communication skill in today's world; however, many students experience problems such as

low enthusiasm (or reduced motivation) and high anxiety, which may hinder progress (1). In this context, learning styles, brain dominance, and emotional intelligence may play meaningful roles in either fostering or reducing anxiety and in strengthening students' enthusiasm for learning a second language (2).

One important variable linked to second language learning anxiety and enthusiasm is learning style. Many educators and psychologists argue that learners' preferred learning styles are important for effective learning, and that using learning-style-related strategies in instruction can improve learning efficiency (3). Learning styles are commonly described as relatively stable individual preferences and patterns in how learners perceive, process, and engage with learning tasks (4). For example, students who learn better through visual input may perform more effectively and experience more enjoyment in learning environments that support visual materials. When teaching approaches align with students' preferences, learning tends to become easier and more rewarding; in contrast, mismatches between instruction and preferences may make learning and mastery more difficult (5). Empirical research also suggests that learning environments designed around learning styles—especially adaptive learning settings—can increase learning efficiency, improve user satisfaction, reduce learning time, and enhance performance (3, 5). Therefore, identifying students' learning style preferences, particularly their instructional priorities and information-processing tendencies, can provide valuable guidance for designing more effective learning interventions (6).

A second factor is brain dominance, often discussed through whole-brain or brain quadrant perspectives. The concept of hemispheric dominance is historically linked to early neurological ideas about leading hemispheres and later developments in brain dominance models (7). Educational interest in this topic has increased across school and university levels because brain-related preferences may influence thinking, learning, and problem-solving (8). In whole-brain approaches, different "quadrants" are associated with different cognitive and affective functions, and relative dominance or balance across quadrants may shape learning behavior and emotional regulation (7). From this perspective, individuals who can use or balance different brain-related processing modes may cope more effectively with stressful learning situations and may be better positioned to manage language learning challenges (9). Prior Iranian research has also discussed links between brain quadrant dominance and emotional intelligence (10).

Anxiety is one of the most important psychological issues in modern societies and can meaningfully affect individuals' quality of life. In the context of language learning, anxiety may be particularly disruptive because it can interfere with attention, working memory, and performance. Clinically and psychologically, anxiety is described as a negative emotional state characterized by worry-related subjective experiences, physiological arousal, and disturbed or racing thoughts (11). It may include symptoms such as tension, elevated blood pressure, increased breathing and heart rate, sweating, dizziness, chest pain, and swallowing difficulties (12). Research attention to anxiety has increased because anxiety disorders are common and often co-occur with other conditions (13).

Importantly, theoretical and applied work suggests that emotional self-regulation capacities including those associated with emotional intelligence can buffer stress responses and reduce anxiety intensity (8). Alongside anxiety, enthusiasm/engagement for learning is a core construct associated with persistence, sustained effort, and academic success. Over the past two decades, academic engagement has attracted strong interest because it offers a comprehensive way to understand student motivation and learning, and it is considered a robust predictor of performance, progress, and school success. Prior research indicates a positive relationship between engagement and learning quality and academic achievement (14).

A further key factor is emotional intelligence (EI), which may influence second language learning by shaping how students perceive, understand, and regulate emotions in learning contexts (15). Individuals with higher EI may manage their emotional reactions more effectively, which can help reduce anxiety and support sustained motivation. Emotional intelligence has been conceptualized both as a mental ability (e.g., perceiving, using, understanding, and managing emotions) and as a trait-like tendency to regulate emotions (16).

Mayer et al. (2011) present a four-branch model that includes (1) perceiving and expressing emotion, (2) using emotion to facilitate thinking, (3) understanding emotion,


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and (4) managing emotion. Because emotion regulation is linked to psychological well-being, mental health, and academic functioning, EI-related processes are considered highly relevant to learning under stress and performance pressure. Previous research suggests that learning styles and brain dominance may influence both anxiety and engagement in second language learning (8). For example, Dembo and Howard (2007) reported that students with certain learning preferences (e.g., visual or auditory tendencies) may experience lower anxiety and show greater willingness to learn (6). Papi (2023) similarly emphasized that balance across brain quadrants may reduce anxiety, and related work has suggested that dominance in particular cognitive-linguistic modes may be associated with lower vulnerability to anxiety and stronger motivation (17). In addition, learning styles and brain dominance have been linked to language skill development; for example, some evidence indicates that visual and auditory learning styles may support reading and listening, while certain cognitive-linguistic dominance patterns may relate to writing and grammar development (18). Such findings highlight the practical importance of understanding these individual differences so that language teachers can tailor instruction to learners' characteristics. Accordingly, the present study investigates whether learning styles, brain quadrant dominance, and emotional intelligence are related to anxiety and enthusiasm/engagement in second language learning among lower and upper secondary school students. The central research question is: Is there a relationship between learning styles, brain quadrant dominance, and emotional intelligence with anxiety and enthusiasm for second language learning?

## 2. Methods and Materials

Study Design and Participants

This study was applied in terms of purpose and descriptive–correlational in terms of data collection. It was conducted using a multivariate correlational design. The statistical population consisted of all male and female students in the first and second levels of secondary school in Alborz Province during the 2022–2023 academic year (N = 2,900). The sample included 300 secondary school students selected through a multistage cluster sampling method as follows. First, two educational districts (Districts 3 and 4) of the Karaj Department of Education in Alborz Province were selected using cluster sampling. Next, five schools were randomly selected from each district (10 schools = 2 × 5). From each selected school, two grade levels were chosen, and from each grade level, 30 students who were willing to participate in the study were selected. Thus, the sampling process involved selecting two districts, then five schools from each district, two grade levels from each school, and finally 30 students from each grade level. The inclusion criteria were: (a) age range between 13 and 18 years, and (b) signed informed consent. It should be noted that researchers and statisticians have proposed various approaches for determining sample size in correlational studies. In the present study, a regression-based model was used to estimate the required sample size. Based on an effect size of 0.10, statistical power of 0.80, five latent variables, twelve observed variables, and a significance level of 0.05, the estimated required sample size was 308 participants.

Data Collection Instruments

The data required to test the research hypotheses were collected using standardized questionnaires. The instrument package was developed based on four established measures in the literature. Learning styles were assessed using the Learning Style Inventory (LSI) developed by Kolb and colleagues (1985), which is grounded in Kolb's experiential learning theory (19). Emotional intelligence was measured using the instrument developed by Bradberry and Greaves (2004), which is conceptually aligned with the ability model of emotional intelligence proposed by Mayer and Salovey (8). Brain dominance (hemispheric preference) was assessed using the Herrmann Brain Dominance Instrument (HBDI) introduced by Herrmann (1980, 1996). Finally, second language learning orientation was measured using a questionnaire developed by Knowles and colleagues (2000), based on principles of adult learning theory (20).

**Learning Style Inventory**

The Learning Style Inventory (LSI) was developed by David A. Kolb (1985) based on his experiential learning theory (19). In recent years, this instrument has been widely used in educational psychology and learning research, particularly for identifying learning styles and preferences. The LSI measures individuals' learning approaches across two bipolar dimensions: Concrete Experience (CE) versus Abstract Conceptualization (AC), and Reflective


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Observation (RO) versus Active Experimentation (AE). The combination of these two dimensions results in four learning styles: Diverging, Converging, Assimilating, and Accommodating (19). The questionnaire consists of 12 items, each containing four response options. Respondents rank the four options from 1 to 4 according to how well each statement reflects their own learning approach. This scoring procedure yields four composite scores corresponding to the four learning modes: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). Learning styles are determined by calculating the difference scores (AC − CE) and (AE − RO), which position individuals within Kolb's two-dimensional learning space (19).

Regarding the Persian version, Khodabandeh et al. (2014) examined the concurrent validity of the instrument (21). For each subscale, one criterion item representing the content domain was developed, and correlations between the subscale items and the corresponding criterion item were calculated. All correlations were statistically significant at the 0.01 level. The correlation coefficients were 0.73 for Concrete Experience, 0.68 for Reflective Observation, 0.76 for Abstract Conceptualization, and 0.65 for Active Experimentation. Reliability was assessed using Cronbach's alpha, the Spearman–Brown coefficient, and split-half reliability. Cronbach's alpha coefficients were reported as 0.75 for Concrete Experience, 0.73 for Reflective Observation, 0.77 for Abstract Conceptualization, and 0.76 for Active Experimentation, indicating acceptable internal consistency.

**Bradberry–Greaves Emotional Intelligence Questionnaire**

The Bradberry–Greaves Emotional Intelligence Questionnaire consists of 28 items designed to assess overall emotional intelligence as well as four subscales: self-awareness, self-management, social awareness, and relationship management. The instrument is structured according to a competency-based model of emotional intelligence that aligns conceptually with the broader ability framework proposed by Mayer, Salovey, and Caruso (2008) (8).

Responses are scored using a 6-point Likert scale ranging from 1 (never) to 6 (always). The total score is obtained by summing the responses to all items. The questionnaire includes four subscales:

- **Self-awareness:** Items 1–6
- **Self-management:** Items 7–15
- **Social awareness:** Items 16–20
- **Relationship management:** Items 21–28

Based on the scoring guidelines, a total score above 80 indicates high emotional intelligence, scores between 60 and 80 indicate moderate emotional intelligence, and scores below 60 indicate low emotional intelligence. The validity and reliability of the Persian version of the questionnaire have been confirmed in Iran. Ganji (2006) examined convergent validity by administering the instrument alongside the Bar-On Emotional Quotient Inventory (Bar-On, 1997) in a sample of 97 participants, reporting a statistically significant correlation at the 0.01 level. In the same study, reliability coefficients for the four components were 0.73 (self-awareness), 0.78 (self-management), 0.76 (social awareness), and 0.76 (relationship management). In an additional sample of 284 participants (115 males and 139 females), the overall Cronbach's alpha coefficient was reported as 0.88 (22). In the present study, reliability was assessed in a pilot sample of 60 students. Cronbach's alpha coefficients were 0.88 for self-awareness, 0.84 for self-management, 0.80 for social awareness, and 0.76 for relationship management. The overall emotional intelligence score yielded a Cronbach's alpha of 0.82. Split-half reliability coefficients were 0.84 using the Spearman–Brown formula and 0.86 using the Guttman method, indicating satisfactory internal consistency.

**Brain Quadrant Dominance Questionnaire**

The original version of the Thinking Preferences Questionnaire is the **Herrmann Brain Dominance Instrument (HBDI®)**, developed by Ned Herrmann to assess individuals' thinking preferences based on the Whole Brain® Model (23). The HBDI categorizes cognitive styles into four quadrants: Quadrant A (analytical), Quadrant B (organized/sequential), Quadrant C (interpersonal/emotional), and Quadrant D (holistic/creative) (23). Because scoring of the original 120-item HBDI is administered exclusively by Herrmann International, the present study employed a 60-item version equivalent to the original instrument. This adapted questionnaire measures individuals' preferred activities


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across the four brain quadrants in accordance with Herrmann's theoretical framework (23).

Each subscale corresponds to one of the four brain quadrants (A, B, C, and D). To calculate the score for each quadrant, the scores of the individual items related to that quadrant are summed. The score range for each subscale is 0 to 60. Higher scores indicate stronger dominance or preference for the corresponding brain quadrant, whereas lower scores indicate weaker dominance. Regarding validity, empirical evaluation of the HBDI began in the mid-1970s, and statistical analyses have supported the presence of four distinct cognitive preference clusters (24). These findings provide foundational construct validity evidence for the four-quadrant structure of the instrument.

**Second Language Learning Anxiety and Motivation Questionnaire (Language Learning Orientations Scale)**

The Language Learning Orientations Scale was developed by Knowles and colleagues in 2000. It assesses second-language learning orientations across three main domains: amotivation, extrinsic motivation, and intrinsic motivation. The questionnaire includes 21 closed-ended items rated on a 7-point Likert scale (from *"not true at all"* to *"completely true"*), scored 1 to 7. The scale has three major factors with the following structure:

- Amotivation: Items 1–3
- Extrinsic motivation (three subscales):
  - External regulation: Items 4–6
  - Introjected regulation: Items 7–9
  - Identified regulation: Items 10–12
- Intrinsic motivation (three subscales):
  - Knowledge: Items 13–15
  - Achievement: Items 16–18
  - Stimulation: Items 19–21

Knowles et al. (2000) reported acceptable internal consistency using Cronbach's alpha, with coefficients for the three main subscales ranging from 0.67 to 0.88, and reported satisfactory validity (20). In an Iranian study, Shaikholeslami (2006) reported reliability coefficients of 0.70 (amotivation), 0.78 (extrinsic motivation), and 0.79 (intrinsic motivation) (25). They also reported Cronbach's alpha coefficients for specific regulation types as follows: amotivation 0.89, external regulation 0.61, introjected regulation 0.72, identified regulation 0.85, knowledge 0.82, achievement 0.75, and stimulation 0.82 (25).

**Procedure**

To conduct the study in Alborz Province, an official letter was first issued by the university and submitted to the Departments of Education in Districts 3 and 4 (Karaj). After review of the questionnaires and obtaining formal permission from relevant authorities, the questionnaires were distributed among first- and second-level secondary school students in selected schools within these districts. Parental permission was obtained, and completed questionnaires were collected for statistical analysis.

**Statistical Analysis**

Descriptive statistics—including frequency, percentage, mean, standard deviation, minimum, and maximum were used to describe the data. Inferential analyses focused on checking assumptions for correlation and multiple regression, and then applying multivariate correlation and multivariate/multiple regression methods.

## 3. Findings and Results

Most participants were female (75.7%) and were enrolled in upper secondary school (78%). The largest age group was 18 years (46.7%). Descriptive statistics showed relatively low amotivation (M = 8.46, SD = 3.84), while intrinsic motivation (M = 44.46, SD = 8.60) and extrinsic motivation (M = 43.19, SD = 6.49) were considerably higher. Regarding learning style dimensions, abstract conceptualization had the highest mean (M = 35.17), followed by reflective observation (M = 34.30), active experimentation (M = 33.31), and concrete experience (M = 33.05). Brain dominance scores were relatively balanced across the four quadrants, with creative thinking (Quadrant D) showing a slightly higher mean (M = 9.78) than the other quadrants. The mean emotional intelligence score was 106.13 (SD = 20.46), indicating a moderate to relatively high level of emotional intelligence among students.

Skewness and kurtosis values for all study variables were within ±1, indicating approximately normal distributions and supporting the use of parametric analyses (Table 1).



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**Table 1**

*Normality test results (skewness and kurtosis) for study variables*

| Research variable | Skewness | Kurtosis |
|---|---|---|
| Amotivation | 0.509 | 0.864 |
| Intrinsic motivation | -0.621 | -0.418 |
| Extrinsic motivation | -0.317 | -0.140 |
| Concrete experience | -0.482 | -0.175 |
| Reflective observation | 0.446 | -0.149 |
| Abstract conceptualization | -0.782 | -0.074 |
| Active experimentation | -0.738 | 0.091 |
| Analytical thinking (Quadrant A) | -0.921 | -0.380 |
| Sequential thinking (Quadrant B) | -0.869 | -0.327 |
| Interpersonal thinking (Quadrant C) | -0.940 | -0.470 |
| Creative thinking (Quadrant D) | 0.848 | -0.392 |
| Emotional intelligence | 0.533 | -0.622 |

Pearson correlation results indicated significant associations between learning styles and motivation components. All learning style dimensions were significantly and negatively correlated with amotivation (r range = −0.356 to −0.434, p = 0.001). In contrast, all learning style dimensions showed significant positive correlations with intrinsic motivation (r range = 0.428 to 0.599, p = 0.001) and extrinsic motivation (r range = 0.395 to 0.668, p = 0.001) (Table 2).

**Table 2**

*Pearson correlations between learning styles and motivation components in second language learning*

| Predictor (learning style) | Amotivation r | p | Intrinsic motivation r | p | Extrinsic motivation r | p |
|---|---|---|---|---|---|---|
| Concrete experience | -0.356 | 0.001 | 0.561 | 0.001 | 0.661 | 0.001 |
| Reflective observation | -0.353 | 0.001 | 0.428 | 0.001 | 0.395 | 0.001 |
| Abstract conceptualization | -0.364 | 0.001 | 0.434 | 0.001 | 0.458 | 0.001 |
| Active experimentation | -0.434 | 0.001 | 0.599 | 0.001 | 0.668 | 0.001 |

Brain quadrant dominance was significantly and negatively correlated with amotivation (r range = −0.385 to −0.549, p = 0.001), and significantly and positively correlated with intrinsic motivation (r range = 0.461 to 0.528, p = 0.001) and extrinsic motivation (r range = 0.408 to 0.547, p = 0.001) (Table 3). Emotional intelligence was significantly and negatively correlated with amotivation (r = −0.146, p = 0.011) and positively correlated with intrinsic motivation (r = 0.195, p = 0.001) and extrinsic motivation (r = 0.249, p = 0.001) (Table 3).

**Table 3**

*Pearson correlations between brain quadrant dominance, emotional intelligence, and motivation components*

| Predictor | Amotivation r | p | Intrinsic motivation r | p | Extrinsic motivation r | p |
|---|---|---|---|---|---|---|
| Analytical thinking (Quadrant A) | -0.385 | 0.001 | 0.528 | 0.001 | 0.547 | 0.001 |
| Sequential thinking (Quadrant B) | -0.398 | 0.001 | 0.461 | 0.001 | 0.408 | 0.001 |
| Interpersonal thinking (Quadrant C) | -0.494 | 0.001 | 0.508 | 0.001 | 0.511 | 0.001 |
| Creative thinking (Quadrant D) | -0.549 | 0.001 | 0.483 | 0.001 | 0.415 | 0.001 |
| Emotional intelligence | -0.146 | 0.011 | 0.195 | 0.001 | 0.249 | 0.001 |

Three multivariate regression models were conducted for the three motivation components. Durbin–Watson statistics



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supported independence of errors for amotivation (1.951), intrinsic motivation (1.888), and extrinsic motivation (1.831).

**Amotivation model.** The overall model was significant ($F = 29.135$, $p = 0.001$) and explained 68% of the variance in amotivation (Adjusted $R^2 = 0.689$). Active experimentation ($\beta = -0.155$, $p = 0.043$), analytical thinking Quadrant A ($\beta = -0.496$, $p = 0.001$), sequential thinking Quadrant B ($\beta = -0.300$, $p = 0.001$), interpersonal thinking Quadrant C ($\beta = -0.581$, $p = 0.001$), creative thinking Quadrant D ($\beta = -0.811$, $p = 0.001$), and emotional intelligence ($\beta = -0.356$, $p = 0.001$) were significant predictors. Concrete experience, reflective observation, and abstract conceptualization were not significant predictors (Table 4).

**Intrinsic motivation model.** The model was significant ($F = 29.135$, $p = 0.001$) and explained 68% of the variance (Adjusted $R^2 = 0.689$). Concrete experience ($\beta = 0.170$, $p = 0.010$), reflective observation ($\beta = 0.117$, $p = 0.032$), active experimentation ($\beta = 0.269$, $p = 0.001$), analytical thinking Quadrant A ($\beta = 0.233$, $p = 0.034$), and emotional intelligence ($\beta = 0.316$, $p = 0.001$) were significant predictors, while abstract conceptualization and the remaining brain quadrants were not significant (Table 4).

**Extrinsic motivation model.** The model was significant ($F = 38.297$, $p = 0.001$) and explained 73% of the variance (Adjusted $R^2 = 0.737$). Concrete experience ($\beta = 0.302$, $p = 0.001$), active experimentation ($\beta = 0.348$, $p = 0.001$), analytical thinking Quadrant A ($\beta = 0.243$, $p = 0.018$), creative thinking Quadrant D ($\beta = 0.238$, $p = 0.017$), and emotional intelligence ($\beta = 0.155$, $p = 0.007$) were significant predictors, while reflective observation, abstract conceptualization, Quadrant B, and Quadrant C were not significant (Table 4).

**Table 4**

*Summary of Multiple Regression Models (Significant Predictors Only)*

| Dependent Variable | Significant Predictor | Standardized β | p-value | Durbin–Watson | Adjusted $R^2$ | F (p-value) |
|---|---|---|---|---|---|---|
| Amotivation | Active Experimentation | -0.155 | 0.043 | 1.951 | 0.689 | 29.135 (0.001) |
| | Quadrant A – Analytical Thinking | -0.496 | 0.001 | | | |
| | Quadrant B – Sequential Thinking | -0.300 | 0.001 | | | |
| | Quadrant C – Interpersonal Thinking | -0.581 | 0.001 | | | |
| | Quadrant D – Creative Thinking | -0.811 | 0.001 | | | |
| | Emotional Intelligence | -0.356 | 0.001 | | | |
| Intrinsic Motivation | Concrete Experience | 0.170 | 0.010 | 1.888 | 0.689 | 29.135 (0.001) |
| | Reflective Observation | 0.117 | 0.032 | | | |
| | Active Experimentation | 0.269 | 0.001 | | | |
| | Quadrant A – Analytical Thinking | 0.233 | 0.034 | | | |
| | Emotional Intelligence | 0.316 | 0.001 | | | |
| Extrinsic Motivation | Concrete Experience | 0.302 | 0.001 | 1.831 | 0.737 | 38.297 (0.001) |
| | Active Experimentation | 0.348 | 0.001 | | | |
| | Quadrant A – Analytical Thinking | 0.243 | 0.018 | | | |
| | Quadrant D – Creative Thinking | 0.238 | 0.017 | | | |
| | Emotional Intelligence | 0.155 | 0.007 | | | |

## 4. Discussion

The present study aimed to examine the relationships between learning styles, brain quadrant dominance, and emotional intelligence with students' motivational experiences in second language learning among lower and upper secondary school students in Alborz Province. The findings indicated that learning styles were significantly and negatively associated with amotivation, while showing significant positive relationships with intrinsic and extrinsic motivation. These results support the broader view that when students' learning preferences and information-processing tendencies are recognized and accommodated, learning becomes more rewarding and sustained, whereas mismatches between instructional approaches and learner preferences may undermine motivation and increase learning difficulty (1, 3, 5, 6). In line with prior work emphasizing the importance of reducing psychological barriers such as low enthusiasm and high anxiety in second



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language learning, the present findings suggest that learning-style-related factors may be particularly relevant for strengthening students' engagement and motivation in language learning contexts (1, 2). The study also showed that brain quadrant dominance was significantly related to motivational components: higher dominance scores across quadrants were associated with lower amotivation and higher intrinsic and extrinsic motivation. This pattern aligns with whole-brain perspectives suggesting that differences in cognitive–affective processing modes, and the ability to utilize diverse modes, can influence learning behavior and emotional regulation in demanding learning situations (7, 8). From this perspective, learners who more effectively draw on different brain-related processing patterns may cope better with learning challenges and maintain stronger motivational resources when facing pressure in second language learning (9). Related arguments also propose that balanced or adaptive cognitive processing can reduce vulnerability to anxiety and strengthen sustained learning engagement, which is conceptually compatible with the observed reductions in amotivation and increases in motivational components (17). In addition, emotional intelligence was significantly and negatively associated with amotivation, and positively associated with both intrinsic and extrinsic motivation. These findings are consistent with theoretical accounts that conceptualize emotional intelligence as a set of emotion-related abilities and self-regulation capacities that help learners manage stress responses, maintain psychological resources, and persist in learning goals (8). Given that anxiety can interfere with attention and performance in learning settings (11) and is associated with physiological and cognitive symptoms that disrupt functioning (12, 13), emotional intelligence may be especially important as a protective factor that supports motivational stability under stress. Likewise, engagement research emphasizes that sustained participation and effort are central to learning quality and success (14), which conceptually parallels the positive links observed here between emotional intelligence and motivational components in second language learning. Moreover, recent discussions highlight that emotional intelligence can shape how students perceive and regulate emotions in learning contexts, thereby supporting motivation and reducing negative emotional reactions that may otherwise undermine learning (15, 16). Overall, the regression findings indicated that learning styles, brain quadrant dominance, and emotional intelligence jointly explained substantial variance in motivational outcomes (amotivation, intrinsic motivation, and extrinsic motivation). Taken together, the findings underscore the practical value of identifying learners' learning styles and supporting cognitive–emotional resources in language education. In applied terms, instruction that is sensitive to learners' preferred learning approaches and that supports emotion regulation capacities may help reduce motivational barriers and strengthen students' willingness to engage with second language learning tasks. It should be noted that cultural factors may influence brain-related preferences and emotional intelligence, which can limit the generalizability of results across different contexts (7). Additionally, standardized instruments may not fully capture the complexity of brain dominance patterns or emotional intelligence as multidimensional constructs (8). Future studies may benefit from cross-cultural comparisons and from examining how learning styles, brain dominance, and emotional intelligence relate simultaneously to both motivational outcomes and anxiety-related experiences in second language learning settings (1, 2).

## 5. Conclusion

In conclusion, the present findings suggest that learning styles, brain quadrant dominance, and emotional intelligence are meaningfully related to motivational components in second language learning. Strengthening alignment between instruction and learning preferences and fostering emotional regulation capacities may support learners' engagement and reduce motivational barriers in second language education (3, 6, 8).

## Declaration

Artificial intelligence (AI) tools were used solely for language editing, formatting, and improving clarity of expression. AI-assisted tools did not contribute to the study design, data collection, data analysis, interpretation of findings, or generation of results. All intellectual content, data analysis, and conclusions were developed independently by the author. The author takes full


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responsibility for the accuracy and integrity of the manuscript.

## Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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## Declaration of Interest

The authors report no conflict of interest.

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## Ethics Considerations

All research ethics principles were observed. Participation was voluntary and anonymous, confidentiality was ensured throughout the study, and procedures were designed to prevent psychological distress. Findings were reported with integrity and proper citation practices. The study was approved by the Ethics Committee of Islamic Azad University, North Tehran Branch (IR.IAU.TNB.REC.1403.07).

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