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Handedness: Where Language And Body Meet
Studying the effect of linguistic patterns on the association between space and valence in the mind

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Zusammenfassung

Diese Dissertation ist eine vergleichende Studie, die untersucht, wie sprachliche Muster die kognitive Repräsentation von Raum beeinflussen. Es wird allgemein beobachtet, dass in verschiedenen Sprachen die rechte Seite mit positiven Konzepten und die linke Seite mit negativen Konzepten assoziiert wird. Laut der Körperspezifitätshypothese ist "Gutheit" in den Köpfen der Menschen nicht mit links oder rechts, sondern mit der dominanten Seite ihres Körpers verbunden. Diese Hypothese legt nahe, dass die Raum-Valenz-Assoziation körperspezifisch ist; daher haben Rechts- und Linkshänder unterschiedliche räumliche Metaphern in ihren Köpfen. Einige Autoren argumentieren, dass Sprache als allgegenwärtiger Kontext in unserem Leben zur Konstruktion räumlicher Metaphern beiträgt. Studien haben jedoch die Rolle der Sprache noch nicht bestätigt.

Diese Studie untersucht den Einfluss der Sprache auf die Raum-Valenz-Assoziation, indem sie Teilnehmer aus Persisch und Persischer Gebärdensprache (PSL) mit Englisch als Kontrollgruppe vergleicht. Die Methodik dieser Forschung umfasst sowohl linguistische als auch nicht-linguistische Aufgaben. Linguistische Aufgaben beinhalten die Analyse der metaphorischen Verwendung der Wörter "rechts" und "links" im Persischen und deren Vergleich mit den englischen Äquivalenten anhand von Twitter-Daten. Zusätzlich untersucht eine "neue Metapher-Aufgabe", wie persische Teilnehmer Valenz auf neu erstellte Metaphern attribuieren, um festzustellen, ob rechts- und linkshändige persische Teilnehmer räumliche Metaphern ähnlich oder unterschiedlich wahrnehmen.

Die Ergebnisse der linguistischen Aufgaben zeigen, dass es im Persischen starke metaphorische Assoziationen gibt: 'rɒst' (rechts) ist mit positiven Konzepten wie

Wahrheit und Ehrlichkeit verbunden, während 'ʧæp' (links) mit negativen Konzepten wie Lügen und Feindschaft assoziiert wird. Im Englischen sind diese Assoziationen schwächer; 'right' hat positive Konnotationen ähnlich wie im Persischen, aber 'left' ist größtenteils neutral. PSL jedoch fehlt diese laterale Raum-Valenz-Assoziation vollständig. Während PSL 'oben' mit positiven und 'unten' mit negativen Konzepten assoziiert, ähnlich wie gesprochene Sprachen, verwendet es nicht die rechte oder linke Seite des Raums, um positive oder negative Valenz auszudrücken.

Die Hauptfrage lautet: Führen sprachliche Variationen zu unterschiedlichen konzeptuellen Systemen? Um diese Frage zu beantworten, verwendet die Studie nicht-linguistische Aufgaben, um rechts- und linkshändige Teilnehmer aus den Gruppen Persisch, PSL und Englisch zu vergleichen. Diese Aufgaben evaluieren zwei Hypothesen: Die erste Hypothese besagt, dass alle Teilnehmer, unabhängig von ihrer Sprache, ähnlich abschneiden werden, wie es die Körperspezifitätshypothese vorhersagt. Die zweite Hypothese legt nahe, dass Teilnehmer aus unterschiedlichen sprachlichen Hintergründen trotz gleicher Händigkeit unterschiedlich abschneiden werden.

Die Ergebnisse bestätigten eine universelle Assoziation von positiven Emotionen mit "oben" und negativen Emotionen mit "unten" in allen Gruppen. Dieses Ergebnis stellt jedoch die Körperspezifitätshypothese auf zwei Arten in Frage. Erstens attribuierten linkshändige Perser positive Valenz der rechten Seite, im Gegensatz zur Vorhersage der Körperspezifitätshypothese, aber im Einklang mit den starken Mustern in ihrer Sprache. Zweitens zeigten persische Sprecher und PSL-Nutzer unterschiedliches Verhalten trotz ähnlicher Händigkeit. Während rechtshändige persische Sprecher eine starke Tendenz zeigten, Valenz auf den Raum zu attribuieren, zeigten rechtshändige PSL-Nutzer keine laterale Präferenz, was der Vorhersage der Körperspezifitätshypothese widerspricht.

Abschließend legt diese Dissertation nahe, dass Sprache eine bedeutende Rolle bei der Konzeptualisierung von Raum-Valenz spielt und die vorherrschende Ansicht in Frage stellt, dass solche Assoziationen ausschließlich körperspezifisch sind.

Abstract

This dissertation is a comparative study investigating how linguistic patterns affect the cognitive representation of space. It is commonly observed across different languages that the right side is associated with positive concepts, while the left is linked to negative concepts. According to the body specificity hypothesis, "goodness" in people's minds is associated not with the left or right but with the dominant side of their body. This hypothesis suggests that the space-valence association is body-specific; thus, right- and left-handers will have different spatial metaphors in their minds. Some authors argue that language, as an ever-present context in our lives, contributes to constructing spatial metaphors. However, studies have not yet confirmed the role of language.

This study explores the influence of language on space-valence association by comparing participants from Persian and Persian Sign Language (PSL) with English as a control group. The methodology of this research employs both linguistic and non-linguistic tasks. Linguistic tasks involve analyzing the metaphorical usage of the words "right" and "left" in Persian and comparing them with their English equivalents using Twitter data. Additionally, a "new metaphor task" examines how Persian participants attribute valence to newly created metaphors, aiming to determine whether right- and left-handed Persian participants perceive spatial metaphors similarly or differently.

Findings from the linguistic tasks indicate that in Persian, there are strong metaphorical associations: 'rɒst' (right) is linked to positive concepts like truth and honesty, while 'ʧæp' (left) is associated with negative concepts like lies and enmity. In English, these associations are weaker; 'right' has positive connotations similar to Persian, but 'left' is mostly neutral. PSL, however, lacks these lateral space-valence associations entirely. While PSL associates 'up' with positive and 'down' with negative concepts, like spoken

languages, it does not use the right or left sides of space to express positive or negative valence.

The main question is: Do linguistic variations result in different conceptual systems? To answer this question, the study employs non-linguistic tasks to compare right-handed and left-handed participants from Persian, PSL, and English groups. These tasks evaluate two hypotheses: the first hypothesis states that all participants, despite their language, will perform similarly as the body specificity hypothesis predicts. The second hypothesis suggests that participants from different linguistic backgrounds will perform differently despite having the same handedness.

The results confirmed a universal association of positive emotions with "up" and negative emotions with "down" across all groups. However, this result challenges the body specificity hypothesis in two ways. First, left-handed Persians attributed positive valence to the right side, contrary to the prediction of the body specificity hypothesis but aligned with the strong patterns in their language. Second, Persian speakers and PSL users exhibited different behaviors despite sharing similar handedness. Although right-handed Persian speakers showed a strong tendency to attribute valence to space, right-handed PSL users showed no lateral preference, contradicting the prediction of the body specificity hypothesis.

In conclusion, this dissertation suggests that language plays a significant role in the conceptualization of spatial valence, challenging the prevailing view that such associations are solely body-specific.

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To Vahid,

for always being there for me

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Chapter 1: Introduction

1- 1 Background

1-1-1Theoretical Framework

The Western tradition of metaphor theory begins with the Greek philosopher Aristotle. In his work, 'Poetics,' he defines metaphor as giving a name to something that belongs to something else. According to Aristotle, metaphors are primarily used to convey meaning in language, specifically in rhetoric and poetry. He considers metaphor a sign of genius because it cannot be taught and provides an intuitive understanding of unfamiliar concepts. Roman rhetoricians such as Quintilian and Cicero expanded this study of metaphors as a rhetorical tool. Cicero argues that metaphors bring life to speech, giving language beauty and energy.

Throughout the Middle Ages, metaphor was still considered primarily a rhetorical concept. Scholars viewed metaphors as a powerful tool for illustrating and communicating complex theological concepts and frequently used them in scholarly writings and homilies. However, this view evolved with theorists such as John Locke (1874), who argued that metaphors were ornamental aspects of language that could lead to misunderstanding or misinterpretation. He believed that clear and precise language was essential for accurately communicating ideas and that metaphors, while useful in poetry and rhetoric, could obscure meaning rather than clarify it when used in philosophy.

In contrast to Locke, Nietzsche (1873) suggested that metaphors are essential to perceiving reality. According to him, our entire conceptual framework is built upon metaphorical interpretations of sensory experiences. He stated that our understanding of

the world is fundamentally shaped by the linguistic constructs we create, which are themselves based on arbitrary connections between words and their meanings.

The 20th-century philosophers continued to challenge the traditional view of metaphor. In 1936, Richards discussed that metaphor is not just a decorative linguistic device but a fundamental mechanism of thought, essential for communication and understanding. He introduced the concepts of the "tenor" (the main subject) and the "vehicle" (what the subject is compared to) and suggested that metaphors engage two different ideas to create new meanings. According to him, when using metaphors, two distinct thoughts of different things are actively engaged, creating meaning through their interaction, which is essential for making abstract concepts more accessible and enhancing our comprehension of the world around us.

Max Black (1979) introduced the "interaction theory" of metaphors. Unlike traditional views that see metaphors as mere comparisons, Black suggested that metaphors create a dynamic interaction between two concepts. This interaction arises from the contrast between the metaphor's main subject, known as the "focus," and the metaphorical context, referred to as the "frame." The meaning of a metaphor is a product of the interaction between these two thoughts.

As mentioned, different scholars have discussed the idea that metaphor extends beyond poetry and fanciful language. However, it was the groundbreaking book "Metaphors We Live By" by Lakoff and Johnson in 1980 that solidified this perspective and revolutionized the study of metaphor. In their book, Lakoff and Johnson presented a comprehensive analysis of how metaphors shape our everyday thinking and language and highlighted metaphors' pervasive and fundamental role in our lives.

According to the conceptual metaphor theory (CMT), a conceptual metaphor goes beyond language and involves understanding one domain of experience, typically abstract and less tangible, in terms of another concrete and more perceptible domain. In other words, a conceptual metaphor involves mapping correspondences from a source domain onto a target domain. CMT suggests that our conceptual system is metaphorical in nature, and people use metaphors not only to communicate about the world but also to think about it. Even everyday abstract concepts such as time, states, emotions, causation, and purpose can be understood metaphorically. As a result, the meaning of the term "metaphor" has changed in conceptual metaphor theory and denotes "a cross-domain mapping within the conceptual system." Thus, a "metaphorical expression" refers to a linguistic expression like a word, phrase, or sentence representing the outward manifestation of such a cross-domain mapping. This new understanding of metaphor differs from its previous usage in earlier theories.

Lakoff and Johnson (1980) present "Love is a journey" as a clear illustration of the conceptual metaphors. This metaphor involves interpreting the experiential domain of love in terms of the significantly different domain of a journey. According to them, metaphor can be seen as a mapping from the source domain (travel) to the target domain (love). This mapping exhibits a structured nature, where entities in the domain of love (like lovers, shared goals, difficulties, and the love relationship) systematically correspond to entities in the domain of a journey (such as travelers, the vehicle, and destinations). They argue that if metaphors were solely linguistic expressions, we would expect different linguistic expressions to represent distinct metaphors. For instance, "We've hit a dead-end street," "We can't turn back now," and "Their marriage is on the rocks" would each signify separate metaphors. However, in this case, we do not observe numerous distinct metaphors. Instead, we perceive a unified metaphor where love is

conceptualized as a journey. This metaphorical mapping clearly depicts how love is understood as a journey and is reflected in various linguistic expressions.

Lakoff and Johnson (1999) further develop their theory in their book "Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought". They argue that our conceptual understanding is shaped by our bodily experiences and interactions with the world, which challenges traditional Western philosophical assumptions that separate the mind from the body.

They emphasized the importance of embodied experiences in shaping our conceptual systems. They argued that there is a system of hundreds of primary conceptual metaphors that we all learn at a young age, typically by age four. These metaphors arise from cases where the source and target domains are coactive in our experiences. For instance, the experience of pouring juice into a glass or piling up objects involves the coactivity of verticality and quantity, which serves as the experiential grounding for the conceptual metaphor "MORE IS UP."

Gibbs (2009) discussed that conceptual metaphor theory has significantly impacted various fields. Firstly, it has played a crucial role in developing cognitive linguistics, providing a new perspective on linguistic structure and behavior. Additionally, it offers a theoretical framework and empirical method for understanding the pervasive nature of metaphorical language and thought, recognizing metaphor as a fundamental aspect of human thinking. Moreover, conceptual metaphor theory has contributed to studying how language shapes thought, going beyond the Sapir-Whorf Hypothesis and considering the establishment and influence of abstract concepts in various domains of human thought and language use. Lastly, Gibbs argues that conceptual metaphor theory has been instrumental in exploring embodied cognition, emphasizing the role of bodily experiences

in shaping metaphorical understanding and its connections to culture and linguistic patterns.

After the introduction of conceptual metaphor in 1980, numerous empirical studies from various disciplines, such as linguistics, psychology, cognitive neuroscience, and anthropology, have provided evidence supporting Lakoff and Johnson's theory. These findings go beyond figurative language and influence cognitive functions such as memory, evaluation, stimulus discrimination, and shifts of attention (Crawford, 2009).

This research focuses on the conceptual metaphors that use space as their source domain to conceptualize the abstract domain of emotional valence[1]. Lakoff and Johnson (1980) acknowledged that emotions are inherently abstract and challenge conceptual systems. They suggest that emotions find representation in more tangible dimensions of experience, such as space. According to their argument, metaphors are crucial in facilitating this process by enabling us to conceptualize emotions concretely. They state:

> "*Although a specific conceptual structure for space emerges from our perceptual-motor performance, no specific conceptual structure for emotion emerges from our affective performance alone... [metaphors] allow us to conceptualize our to understand emotions in clearer terms*" (1980, p. 58).

According to Johnson & Lakoff (2002), in addition to facilitating the expression of emotions, conceptual metaphors also play a fundamental role in shaping our understanding of emotional experience. The choice of specific metaphors to represent emotional experiences is influenced by the correlation between our emotions and

[1] Valence refers to the intrinsic attractiveness (positive valence) or averseness (negative valence) of an event, object, or situation. The concept of valence is used to describe the emotional charge associated with a particular stimulus, indicating whether it is perceived as essentially positive or negative in nature.

sensorimotor experiences. In other words, conceptual metaphors are rooted in our physical or cultural experiences.

They argued that orientational metaphors are particular conceptual metaphors that relate abstract concepts to spatial orientations. One prominent example they discussed is the metaphor "good is up." According to this metaphor, there is a conceptual link between the vertical dimension of space and our understanding of the abstract concept of goodness. Lakoff and Johnson argue that numerous linguistically coherent expressions, such as "He does high-quality work," "We hit a peak last year," and "Things are looking up," are not random phrases but are manifestations of a more profound conceptual metaphor: "good is up."

According to them, the association between positive emotions and upward-oriented behaviors is rooted in our bodily experiences. As humans, we possess a vertical bodily orientation. We tend to exhibit upward-oriented behaviors when we experience positive emotions like happiness and joy. For example, when we are happy, we might feel more active, move around, jump up, or have a smile that turns up the corners of our mouths. Consequently, our sensorimotor perceptions of up versus down influence our understanding and evaluation of paired concepts like good and bad. Conversely, we might associate negative experiences with downward-oriented behaviors. This metaphorical mapping can influence our cognitive processes, such as memory, evaluation, attention, and linguistic expressions.

The significance of the "good is up" metaphor lies in its universality across languages and cultures. Studies revealed that similar orientational metaphors are observed in other languages, such as Chinese (Yu, 1995) and Hungarian (Kövecses, 2005). Despite linguistic and cultural differences, these languages share the metaphorical mapping

between verticality and goodness. This raises the question: How can languages and cultures that are so different produce such remarkably similar shared metaphors?

To better comprehend the origin of these shared metaphors, scholars suggest that the existence of universal bodily experiences may provide a foundation for the development of universally recognized conceptual metaphors. Universal bodily experiences shape our understanding of abstract concepts like emotions, and this understanding is reflected in language and culture. Consequently, universal conceptual metaphors exist, although it is important to note that the linguistic expressions and manifestations of these metaphors can vary across different languages and cultural contexts (Kövecses, 2000; Grady, 1997; Barcelona, 2000; Maalej, 2004; Kövecses, 2015; Pitt & Casasanto, 2021).

Meier and Robinson (2005) conducted a series of experiments to test the conceptual metaphor "good is up" empirically. They asked participants to rate the positivity or negativity of words presented in the upper or lower part of a computer screen. The findings showed that participants were faster to recognize positive words when placed on the upper part of the screen and negative words when on the lower part, suggesting an intrinsic link between affective valence (positive or negative emotions) and vertical spatial orientation. The study provides empirical support for the metaphorical association of good with up and bad with down. As the authors argued, this association is not just linguistic but reflects a more profound cognitive process where vertical spatial orientation influences how we perceive and evaluate valence.

1-1-2 The Body Specificity Hypothesis

Based on embodied conceptual metaphor, Casasanto (2009) argued that if different bodies result in different conceptual metaphors, individuals with different physical characteristics, such as handedness, may have distinct cognitive representations and associations.

He states: "*people with different bodily characteristics, who interact with their physical environments in systematically different ways, should form correspondingly different mental representations. I call this proposal the body-specificity hypothesis.*"

The body specificity hypothesis suggests that our physical bodies, including which hand is dominant, play a fundamental role in shaping our abstract conceptualizations, including our understanding of moral and ethical judgments. To investigate this, Casasanto (2009) conducted experiments examining the relationship between handedness and positive or negative valence. In these experiments, participants were shown a sheet. This sheet depicted a cartoon character named Bob, viewed from above. There was a box on Bob's left and another on his right. They were informed that Bob loved zebras (good) but disliked pandas (bad), or vice versa. Participants were asked to draw the good animal in the box corresponding to positive things and the bad animal in the box corresponding to negative things. The goal was to determine if right-handed and left-handed participants would perform similarly or differently.

The results revealed that right-handers tended to place good stimuli on the right side, while left-handers preferred the left side. This pattern was also observed in native speakers of Dutch in the Netherlands, thus generalizing the findings to a new population. In another experiment, participants judged alien creatures placed on the right side or left side. The result showed that participants significantly associated positive attributes with the creature featured on the side corresponding to their dominant hand. In the final experiment, participants evaluated products based on advertisements placed on a page's left or right sides. Findings showed that right-handers preferred products advertised on the right, and left-handers preferred those on the left side.

Casasanto and Jasmin (2010) investigate the relationship between hand gestures and speech during the final debates of the 2004 and 2008 US presidential elections. They analyze the speech and gestures of both right-handed (Kerry, Bush) and left-handed (Obama, McCain) candidates. The study found that right-handed candidates associated right-hand gestures more strongly with positive messages and left-hand gestures with negative messages, while the opposite pattern was observed for left-handed candidates. This result suggested a relationship between hand gestures and valence, supporting the body-specificity hypothesis.

Willems et al. (2010) used fMRI to investigate how right- and left-handed individuals process the meanings of action verbs. The results showed that right-handers and left-handers utilized opposite premotor areas of the brain when understanding manual action verbs. This finding suggests that one's handedness influences the neural representation of verb meanings, supporting the body-specificity hypothesis.

Casasanto and Dijkstra (2010) explored the link between the dominant hand and moral judgments. The result showed that participants judged actions as more moral when performed with their dominant hand.

Casasanto and Chrysikou (2011) conducted two experiments involving stroke patients and participants wearing bulky ski gloves. The findings revealed that long-term changes in motor fluency could reverse the association between spatial orientation (right/left) and emotional valence (good/bad). Moreover, even short-term changes in motor fluency caused natural right-handers to associate "good" with "left," similar to natural left-handers. The study suggested that altering hand usage could influence individuals' judgments regarding abstract concepts such as goodness and badness. The researchers

concluded that motor experience significantly determines the direction of space-valence associations.

Casasanto and Henetz (2012) conducted two experiments involving children aged 5 to 10 to explore the associations between space and valence. The children were asked to place preferred and dispreferred toys on a diagram in the first experiment. They had to indicate where they believed each toy should be positioned. The second experiment involved judgments about intelligence and kindness. The children were shown cartoon animals and were asked to evaluate which animals they considered smarter or kinder. The results indicated that children significantly associated positive ideas with their dominant side and negative ideas with their non-dominant side. The study supported the role of handedness in shaping spatial metaphors independent of cultural and linguistic influences.

Brunyé et al. (2012) investigated how handedness impacts the mental representation of affective valence. They asked participants to navigate virtual environments and recall object locations. Their findings indicated that right-handers and left-handers differ in how they encode and recall spatial information, influenced by their dominant hand.

De la Vega et al. (2012) investigated whether the association between valence and spatial direction is influenced more by the physical position of the hands or by the inherent left-right orientation. The experiment involved participants responding to positive and negative stimuli using keyboard keys, with their hands either in a congruent position (left hand on the left side, right hand on the right side) or an incongruent position (left hand on the right side, right hand on the left side). Findings indicated that the association between emotional valence and spatial direction was related to the hand used to respond rather than to the side of space. Specifically, when participants used their right hand to

respond to positive stimuli and their left hand to respond to negative stimuli, they were faster and more accurate, even if their hands were crossed and their responses did not align with the typical left-right spatial mapping. This result suggested that the space-valence association is more deeply related to the bodily experience of using one's hands than the abstract concept of the left and right sides of space.

Casasanto (2011, 2014) proposed the theory of bodily relativity based on an analogy to linguistic relativity and cultural relativity theories. According to Casasanto, individuals with different bodily characteristics interact with their environment in different ways, leading to variations in certain aspects of their thinking relative to their specific bodily characteristics. However, the role of language in the association between lateral space and valence has remained relatively unexplored.

Casasanto (2014) argues that body and language are two ever-present contexts in our lives. Therefore, assuming both are involved in the space-valence association is reasonable. He noted that the studies so far have not been able to confirm the effect of language.

According to Foolen 2019, there is widespread bias across many different languages and cultures that positive concepts are related to the right side and negative concepts to the left side of space.

Schiefenhövel (2013) explored the semantic biases for "right" and "left" across 50 Indo-European and non-Indo-European languages. According to him, there is variation in the etymological roots of the terms 'right' and 'left' within Indo-European languages. Nevertheless, both Indo-European and non-Indo-European languages consistently associate positive connotations with the right and negative connotations with the left. Schiefenhövel discusses the presence of euphemistic terms for the left in specific

language groups, such as Scandinavian, Greek, and Avestan, which may stem from historical acts of political correctness or a tendency to avoid naming the negative. Paradoxically, these euphemistic terms reinforce the negative image associated with the left. As a result, he suggests a universal human evaluation process influenced by embodiment principles. He stated:" *The terms for right never have, in any of the examined languages, a negative bias; the words for left, usually never positively biased*".

Casasanto and Henetz (2012) discussed that *left* is associated with clumsiness in English but not necessarily with evil or filth. Then, it is still a question whether left-handed people from cultures with stronger left-hand taboos would still show a "*good is left*" mapping or if culture would affect the space-valence association.

La Fuente et al. (2015) conducted a replication study of Casasanto's (2009) Bob task, comparing participants from Spanish and Moroccan cultures. Moroccan culture has stronger taboos against using the left hand, leading to a greater preference for the right hand than Spanish culture. The study aimed to determine if the cultural influence on space-valence associations is more pronounced in Arab participants. The results did not show a significant difference between Moroccan and Spanish right-handers. They concluded that the implicit association between left-right space and valence is body-specific and does not appear to be significantly influenced by cultural factors. However, this study did not include left-handed Moroccan individuals.

Li and Cao (2019) compared the association between lateral space and valence in Tibetan practitioners of Bön, a religion that exhibits a preference for the left side in some symbols, with English speakers living in England. The researchers hypothesized that if culture plays a significant role, Bön practitioners will associate goodness with the left side based on their religious convictions. However, the results indicated that the association of goodness with the right side did not significantly differ between right-handed Bön

practitioners and British participants. The result confirmed the body-specificity hypothesis, emphasizing that spatial conceptual metaphors for valence are influenced by an individual's handedness rather than cultural experiences. However, the study had a limited number of left-handers, which included only five left-handed participants comparing the 133 right-handed Tibetan practitioners of Bön.

So far, various methods have been employed to compare right-handed and left-handed participants within the same culture. Additionally, a few studies have examined the association between lateral space and valence among participants from different cultures, all supporting the body-specificity hypothesis. However, these studies have mainly focused on spoken languages, which tend to be biased toward the horizontal axis. Consequently, cognitive linguistics has faced a notable challenge in determining how language influences the association between lateral space and valence in the mind, given the consistent patterns observed across all languages.

1-2 The Present Study

1-2-1 Objectives and Hypotheses

This study investigates the association between the left/right sides of space and valence in the mind, contributing to our understanding of how the mind perceives the world. The body-specificity hypothesis suggests that the body is the only determinant that plays a crucial role in shaping this association. Since then, numerous studies have been conducted to assess its validity. Researchers have compared groups of right and left-handed participants or groups of right-handed participants from different cultures. However, all studies so far have focused exclusively on spoken languages.

There is a positive bias towards the right side in spoken languages, considered a widespread tendency across languages. All participants in the experiments studied so far have shown varying bias levels in attributing positive ideas to the right side due to their language preference. Thus, no study thus far has been able to compare participants from a language with a positive bias towards the right side to one that lacks such a preference or favors the left side. Therefore, determining the role of language in the association between the right/left sides of space and valence poses a significant challenge and represents a major gap in cognitive studies.

The present study is an experimental investigation aimed at exploring the influence of language on the association between space and valence in the mind. It involves comparing participants from a language characterized by strong valence-lateral space associations with those from a language lacking such associations, focusing on Persian and Persian Sign Language. Unlike Western languages such as English, Persian exhibits a pronounced metaphorical connection between positive/negative concepts and right/left sides of space. Conversely, Persian Sign Language does not attribute positive or negative valence to either side of lateral space. The critical question is whether this significant linguistic difference shapes distinct spatial metaphors in participants' minds. Additionally, participants from English, the most studied language in the literature, are included in this study as a control group.

Initially, the study aims to validate two central statements: first, that Persian demonstrates a robust lateral space-valence association, and second, that Persian Sign Language does not exhibit relating lateral space to valence.

To address the first statement, a comparative sampling analysis was conducted between spatial metaphors in Persian and English. This sampling study investigates whether

Persian displays a stronger association between lateral space and valence. The method involves comparing the metaphorical usage and connotations of two Persian words, "rɒst" (right) and "ʧæp" (left), alongside their English equivalents, "right" and "left," using a substantial dataset sourced from Twitter.

To address the second statement, a comparison was made between Persian and Persian Sign Language to explore how Persian Sign Language conveys the spatial metaphors expressed in the Persian spoken language. The question is whether Persian Sign Language employs signs for the right and left sides of space to create metaphors in a similar way to how the Persian spoken language utilizes the words "rɒst" (right) and "ʧæp" (left).

The experiments of this thesis include a linguistic task and three non-linguistic tasks: a horizontal task, a vertical task, and a four-sided task. The linguistic task (the new metaphor task) is conducted in the Persian language, aiming to explore and compare the valence associated with the words "rɒst" (right) and "ʧæp" (left) in the minds of both right and left-handed Persian participants. The question is whether right and left-handed Persian participants, despite their differing handedness, perceive these words with similar or different valence.

The non-verbal tasks are conducted with both right-handed and left-handed participants from three languages: Persian, Persian Sign Language, and English. The nonverbal tasks aim to investigate two distinct hypotheses:

1. The first hypothesis posits that only bodily experiences shape the lateral space-valence association in the mind. According to the Body Specificity Theory, differing dominant hands among right and left-handers from any language are expected to yield distinct space-valence associations. Therefore, individuals with different handedness, irrespective of their language, are anticipated to exhibit

unique associations between positive/negative concepts and the right/left sides of space.

2. The second hypothesis proposes that linguistic patterns influence the lateral space-valence association in the mind. If language plays a significant role, we anticipate observing notable differences between participants with identical handedness from different languages. In other words, Persian speakers, exposed to strong patterns of the Persian language, are expected to exhibit different mental spatial metaphors compared to Persian Sign Language participants, whose language does not exhibit any biased attitude. This prediction contrasts with the expectations of the body specificity hypothesis.

An overview of the thesis headings is provided below to enhance clarity regarding the organization of this thesis. This comprehensive overview aims to provide an insight into the structure and content of each chapter, thereby facilitating the understanding of the research's scope.

1-2-2 Structure of the thesis

1-2-2-1 Chapter 1: Introduction

As the opening chapter, this section provides the groundwork for the study by presenting the research background, questions, and hypothesis. Furthermore, it outlines the structure of the thesis.

1-2-2-2 Chapter 2: Cultural and Linguistic Conventions

Chapter 2 explores the impact of cultural and linguistic factors on the correlation between space and emotional valence. The chapter begins with exploring the cultural norms, focusing on the significance of sun worship and its potential role in assigning positive or negative connotations to directions such as right and left. Moreover, it explains the role of handedness in shaping social norms and attitudes, highlighting the inherent asymmetry and perceived hierarchy between the two hands. From a linguistic perspective, this chapter explores the etymology and evolution of terms like "right" and "left" across Indo-European languages, explicitly emphasizing the Persian language. Lastly, the chapter utilizes corpus-based analysis of the Persian linguistics database to delve deeper into the metaphorical connotations attributed to "right" and "left" in Persian literature and discourse.

1-2-2-3 Chapter 3: Twitter Sample Study

Chapter 3 provides a comparative analysis of the emotional connotations associated with Persian words "rast" (right) and "ʧæp" (left) and their English counterparts "right" and "left" through a random sample study conducted on social media platforms. This approach aims to capture contemporary usage of words that may not be fully represented in traditional resources presented in the previous chapter. The study categorizes the valence of the target words into positive, negative, and neutral meanings. This chapter provides a detailed overview of the methodology, including data collection, processing, and analysis.

1-2-2-4 Chapter 4: Sign Language

Chapter 4 reviews the metaphor studies within sign languages, with a specific focus on the horizontal axis. Additionally, this chapter examines whether Persian Sign Language mirrors the metaphorical patterns observed in the spoken Persian language. It entails an analytical procedure wherein Persian sentences collected from Twitter (as discussed in the previous chapter) are translated into Persian Sign Language. The findings reveal similarities and disparities between Persian and Persian Sign Language in metaphorically utilizing space to express emotional valence.

1-2-2-5 Chapter 5: Non-linguistic Tasks

Chapter 6 will discuss three non-linguistic tasks and the process of collecting data from both right-handed and left-handed participants across different languages. The collected data will be thoroughly analyzed to investigate potential differences between right-handed and left-handed individuals within each language, as well as differences between participants with the same handedness from different languages.

1-2-2-6 Chapter 6: Linguistic Task

Chapter 5 introduces the "new metaphor task," which assesses how established linguistic metaphors impact the interpretation of novel compound words. This chapter describes the task's design, the data collected, and the data analysis process. Finally, the results of the analysis are discussed in detail.

1-2-2-7 Chapter 7: Conclusion

The final chapter of the Thesis will discuss the study's findings and compare them with

previous research. It will explore how bodily experiences and linguistic conventions influence space-valence associations in the mind. Additionally, this chapter will outline potential directions for future research.

Chapter 2: Cultural and Linguistic Conventions

2-1 Introduction

Chapter two discusses a well-established trend observed across different cultures and languages, where positive attributes are frequently associated with the right side of space, while negative attributes are often associated with the left side. This chapter explores the cultural paradigms and societal implications related to the right and left sides of space. Furthermore, it investigates the emotional connotations of directional words "right" and "left" in various languages, with a particular focus on the Persian language across different contexts and stages.

2-2 Cultural Conventions

2-2-1 *Right* And *Left* As Directions

Directional words encompass opposing references. In numerous languages, four distinct lexemes distinguish cardinal points: East, West, South, and North. According to Gordon (1971), this universal division of the horizon into four directional words stems from astronomical observations. From an individual's perspective, the noon sun and the North star establish a North-South coordinate, while the sunrise and sunset create an East-West coordinate. However, the precise position of the sun during these events varies based on latitude and season.

The Indo-European community inhabited the northern hemisphere, significantly distant from the Tropic of Cancer. In the Northern Hemisphere, the sun rises in the East, reaches

its highest point in the South, and sets in the West (McManus, 2002). As McManus explained, if one stands facing east toward the sunrise and tracks the sun's movement throughout the day, the sun will consistently remain on the right-hand side.

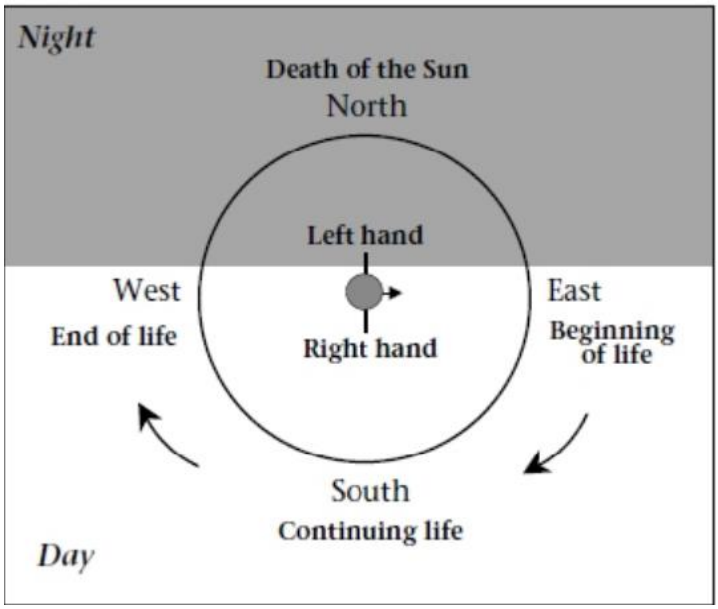


Figure 2.1: The schematic representation of the sun's position during one day (from McManus, 2002)

Wang (2003) discussed that as the sun traverses from the East to the South and eventually sets in the West, the North is marked by the absence of a light source during the day. While the sun sustains life in the South throughout the day, it ultimately perishes in the West. Consequently, the North is often conceptualized as the sun's dark tomb.

Consequently, the East is frequently linked with positive concepts such as sunrise, light, warmth, life, goodness, and divinity. Conversely, the West is associated with negative

connotations such as sunset, darkness, night, danger, death, evil, and negativity. This dualism of East and West often symbolizes the dichotomy between light and dark and life and death, respectively. Hertz (2013) and Giannakis (2019) discuss that this correlation is a universal phenomenon rooted in ancient forms of worship.

According to Gordon (1971), the original four-part frame of reference was initially grounded in the observer's viewpoint but later evolved into the more abstract concept of azimuth. One point among the four was fixed on the horizon, and the others were determined in relation to this fixed point. The notion of azimuth and the four cardinal points predate known religions in history. In the earliest religions of the Middle East, the cardinal points held symbolic meanings rather than simple geographical associations. For instance, ancient Jewish traditions refer to the four corners of the earth, the four winds blowing in heaven, and the four rivers flowing through paradise.

Giannakis (2019) stated that in Iran, the concept of light has been deeply integrated into a dual ethical system of light and darkness, attaining religious significance. The worship of Mithra, the ancient Persian sun god, was adopted by Zoroastrianism, the predominant religion during the Achaemenid Empire, the Parthian Empire, and the Sasanian Empire. Zoroaster depicted the conflict between good and evil as a struggle between light and darkness.

Also, Orientation holds significance in the Eastern church. According to tradition, a bright star appeared in the eastern sky during the birth of Jesus, while it is believed that Christ faced the West when he was crucified. Interestingly, the common English expression "go west" often refers to the act of dying.

As the east/west dichotomy was linked to the right/left dichotomy (Giannakis, 2019), they shared similar meanings and semantic associations. Many Indo-European languages have

comparable roots for the words representing right and south and those representing left and North. Gordon (1971) noted that "*linguistic evidence indicates that the easterly direction was fundamental in the world outlook of the pagan Indo-Europeans, with the root of the words 'north' and 'left' often being the same in Indo-European languages*".

Schiefenhövel (2013) discussed that in Sanskrit, the word "dakshinā" can mean both "south" and "right hand." Similarly, in ancient Hebrew, "yamin" or "yemin" denotes "strong," "correct," "dexterous," and "on the right side," as well as "South" (e.g., Yemen). This direction was considered the right side for someone performing a religious ceremony and facing the East. On the other hand, "semol", which has a possible etymological connection to "dark" and "wrapped," signifies the left side. In modern Hebrew, under the influence of Yiddish, which has roots in Hebrew, Aramaic, German, and Slavic languages, "semol" connotes "clumsy," one of the most common meanings for the left hand across the examined languages.

The similar roots can also be found in Arabic. In Arabic, "Yamin" refers to the right side, right hand, and south, while "Shamal" is used to denote the left side, left hand, and north (Schiefenhövel, 2013; Foolen, 2019). Foolen (2019) stated, "*The Proto-Indo-European roots for left and right have a certain valence, with the caveat that this valence is to be considered as related to culture*."

In Iran, we can trace the positive/negative connotations of space's right and left sides back to around the 3rd or 4th century CE. The book of Shapur (c. 210-276 CE), also known as Shabuhragan, belonged to the Manichaean religion, originally in Middle Persian. One passage from the book reads as follows:

dēnwarān ke az dašn [ā]rag [ē]stēnd ōh gōwē[d] [ku] drist āwarē(d) ašmāh kē āfrīdeg īg.."

He says to the believers who stand on the right hand, "Welcome, you who worshiped."

Another example that demonstrates the duality of right/left and its association with positive/negative connotations is found in a story of two brothers in the Sogdian language, which belongs to the Middle Iranian languages.

H (ə)ðwa ßrāt wimāt-and ēw sāp(a)t rəti yu xwārant nōšaku paru sāpt nōšu patkōn (ə)kartiyā nazšīr rəti yu xwārant parzγām…. sāptī parēw nē patrēθē…

There were two brothers, one left (bad) and the other right(good). The right was always righteous, and the left was always vicious.

2-2-2 Cultural Perspectives on Right and Left-Handedness

Milenković et al. (2019) reported that the left-handed population comprises approximately 10% of various societies, a proportion that has remained relatively consistent from prehistoric times to the present day. According to the authors, the perception of left-handedness has evolved from being associated with the devil to being recognized as a neurological characteristic. However, even in societies that accept left-handedness, parents, and teachers may encourage left-handed children to switch to using their right hand due to the challenges they face in a predominantly right-handed world.

Although the right and left hands may appear similar, they possess inherent asymmetry and inconsistency, leading to a hierarchy and inequality in favor of the right hand. Danesi

(2009) suggested that the anatomical reality of having two hands has resulted in a contrast where right-handedness is perceived as the norm, while left-handedness is seen as different or marked.

Knott (2015) proposed that the concepts of right and left are utilized to express asymmetry, separation, and hierarchy, which establishes cultural and behavioral norms for managing boundaries. This dual effect extends beyond distinguishing between sacred and profane and also represents the difference between pure and impure, permitted and forbidden, and safe from danger. As an illustration, in Islamic tradition, the right hand is customarily used for eating and drinking, while the left hand is reserved for activities such as cleaning, removing dirt, and contact with the genitals. Muslims are also recommended to enter the mosque with their right foot and the bathroom with their left foot. According to the Qur'an, the righteous individuals, known as ʔæshɒb-æl-jæmin (أصْحاب اليَمين) in Arabic, will receive their records with their right hand on the day of resurrection, while the sinners, known as ʔæshɒb-æl-ʃimɒl (أَصْحَابُ الشِّمَال), will receive their records with their left hand.

In the Western gestural system, allocating different tasks to distinct hands was not necessarily aimed at creating a division between the clean right and unclean left. Instead, it formed part of a sophisticated etiquette system designed to refine and structurally organize social conduct (Knott, 2005). For instance, in sixteenth and seventeenth-century European humanist handbooks, activities like blowing one's nose and spitting were designated to be performed behind the left hand.

In Iranian culture, the preference for the right hand was a prevalent paradigm. A story from Golestan Saadi (Chapter 8, Story 101) illustrates this cultural preference and emphasizes the superiority of the right hand over the left.

"*Jamshid was the first person to put an edging around his garment and a ring on his finger. They asked him: "Why did you bestow all the decoration and ornament on the left hand, while the right is superior?" He answered: "Sufficient for the right is the ornament of being right*."

2-3 Linguistic Conventions

As discussed, cultural conventions historically associate positive concepts with the right side and negative concepts with the left side. This section, from a linguistic perspective, delves into the connections between the words "right" and "left" and their corresponding positive and negative values. Firstly, the origins of these words in Indo-European languages will be discussed, focusing on their evolution through the different stages of the Persian language. Then, an overview of the diverse meanings attributed to the words "right" and "left" in Persian monolingual dictionaries will be provided. Finally, a corpus analysis will be conducted using the Persian Linguistic Database (PLD) to compile a collection of illustrations displaying the metaphorical connotations associated with the words "rɒst" and "ʧæp" in Persian.

2-3-1 Words "*right"* And "*left"* In Indo-European Languages

The word "right" originates in the Proto-Indo-European root *reg-, which means "move in a straight line, to rule, to lead straight, to put right." This root gave rise to words such

as "riht" in Old English, which means both "right" and "straight," as well as similar words in other languages such as Middle Dutch and Dutch(*recht)*, Old High German(*reht*), German (*recht)*, Latin(*rectus*), and Old Persian(*rasta)*.

"The word 'left' refers to the opposite direction of 'right,' and is believed to have originated from the Old English term '*lyft,' which meant 'weak' or 'foolish as evidenced by the term "lyft-adl" denoting "lameness" or "paralysis". This sense of 'left' as the weaker hand is also found in related Middle Dutch and Low German expressions such as 'luchter' and 'luft,' as the Online Etymology Dictionary notes.

According to McManus (2009, 2013), while experts may differ on the precise details of the proto-Indo-European word for 'right,' there is a clear consensus among proposed reconstructions. However, McManus highlights the absence of a proto-Indo-European word for 'left. He suggested that adverbs and adjectives in language often occur in pairs, functioning as opposites. If a term for 'right' existed in proto-Indo-European, one would expect a corresponding word for 'left,' given this pattern. However, the absence of such a word raises the question of why 'left' is not attested in proto-Indo-European.

Scholars argue that the absence of the word for 'left' in proto-Indo-European is attributed to a taboo surrounding the concept of 'left' in Indo-European languages (Hertz, 2013; McManus, 2013; Foolen, 2019; Giannakis, 2019). Hertz (2013) stated that the word 'left' tends to be substituted with various constantly changing words. He noted that: "*While there is a single term for 'right' which extends over a very wide area and shows great stability, the idea of 'left' is expressed by a number of distinct terms, which are less widely spread and seem destined to disappear constantly in the face of new words. Some of these words are obvious euphemisms, others are of extremely obscure origin*".

Schiefenhövel (2013) investigated 50 languages from both Indo-European and non-Indo-European origins, discovering that the word for 'right' and 'left' within the Indo-European language family often have distinct etymological roots and may not consistently function as antonyms. He stated the word 'sinister' emerged suddenly in Latin texts without clear links to proto-Indo-European. This word retains its negative and foreboding connotation in contemporary English and German as 'sinister'. Schiefenhövel stated that the German and Dutch words for 'left' have roots in Old High German 'slinc,' transmitted through Middle High German as 'linc' or 'lenc,' implying clumsiness. Similarly, the English word 'left' is derived from Old English 'lyft,' which carried negative connotations of weakness or lameness''. In summary, his investigation revealed that the words for 'right' never have a negative bias in any examined languages, while the words for 'left' are usually not positively biased.

2-3-2 Words *ʀɒst* And *ʧɑɒp* In The Persian Language[2]

Persian is a member of the Indo-Iranian branch of the Indo-European language family. Ancient Iranian speakers spoke many languages and dialects, but only two, Old Persian and Avestan, have survived and are directly attested.

The early Achaemenian dynasty (559 BCE to 330 BCE) utilized Old Persian as its administrative language, found in surviving inscriptions, clay tablets, and seals. On the other hand, Avestan was the language of the Avesta, the holy book of Zoroastrianism, and was spoken around 600 BCE. It is believed to have ceased being used as a spoken

[2] Some resources used in this manuscript used the APA system for phonetic transcription. In these cases, the Persian words for the right and left sides of space are transcribed as noted in the original source. when providing a Persian example from my own input, I will use the IPA system.

language around 400 BCE and was primarily known only to priests. Pahlavi, also known as Middle Persian or Pārsīg, was the official language of the Sasanian Empire, which began around 450 BCE and ended around 650 CE. It was derived from Old Persian and served as the precursor to New Persian.

New Persian, also referred to as Farsi in Persian, represents the last stage of the Persian language spoken in Iran from the 8th to 9th centuries up to the present day. Two other variations of Persian are also recognized, including Dari, spoken in Afghanistan, and Tajik, spoken in Tajikistan. New Persian is primarily derived from Middle and Old Persian and is considered their closest relative.

According to Kent (1953), no distinct words are detectable for the right and left hands in Old Iranian languages. Instead, the word "dastayā-" in Old Persian, derived from the root "dasta-" and "zasta-" in Avestan were used as nouns to mean "hand." In Old Persian, the word "rāsta-" and in Avestan, "rāšta-" were adjectives that denoted the meaning of "right" "correct" and "true"

According to MacKenzie Dictionary (1971), the Middle Persian word "dašn" meaning "right hand", continued to exist in Modern Persian as "dešneh" which refers to a type of dagger traditionally carried using the right hand.

Hassandoust (2010) stated that "čap" in New Persian is most likely derived from the roots "čap-" and "kamp-" meaning "bend" and "crooked", and is related to the Sanskrit words "cāpa-" (bow) and "capalaʹ-" (restless, fluctuating).

Hassandoust (2014) stated that the New Persian word 'rāst', which means 'right', is derived from the Middle Persian 'rāst' and the Old Persian 'rāsta'. This word has retained its meaning as 'truth' and 'correctness.' It replaced the Middle Persian word 'dašn', which

means 'right side' Hassandoust also suggested that 'rāsta' in Old Persian can be traced back to the Proto-Indo-European root '*reg-' According to him, 'haoya' in Avestan and 'hōy' in Middle Persian signify the 'left side'. However, there is no definitive evidence that the New Persian word 'čap' meaning 'left' originates in 'haoya' or 'hōy' in Old or Middle Persian.

The Pārsīg Database provides an extensive collection of Middle Persian terms and their corresponding linguistic data for researchers. This project began in January 2019 and was launched in December 2020 in Iran. The following examples collected from the Pārsīg Database demonstrate the use of the words "dašn," "rāst," and "hōy" in texts from Middle Persian.

1- *nizār ud wēmār būd, pad dašn ālag ōbast ud widard* (Anklesaria, 1964, p. 10æ11).
"The cow got sick and fell to the right side and died"

2- *ma pad rāst ud ma pad drō sōgand ma xwar* (Jamasp-Asana, 1913, p.61)
"Do not swear even right or wrong"

*3- gayōmart pad hōy ālag *ōbast ud widard*
"Keyumars fell to the left and died."

In Modern Persian, the words "rɒst" and "ʃæp" are commonly used to denote space's right and left sides, respectively. According to respected Persian monolingual dictionaries like Dehkhoda and Farhang-e Bozorg-e Sokhan, the word "rɒst" carries various positive concepts and holds the following meanings:

- The right side, the direction towards the East when facing north (opposite of left).
- Straight, signifying an absence of deviation or crookedness.
- Direct, in contrast to being indirect.
- True, in opposition to falsehood.
- Honest and righteous in nature.
- Matching, agreeing, or consistent.
- Coming true, transforming into a reality.
- Organizing and arranging in order.
- Improving and making better.
- Uniformly oriented in one direction, lacking any curves or bends.
- Overtly, without harboring worry or shame.
- Appropriate and suitable for the given context.

On the contrary, the word "ʃæp" in Persian, as mentioned in the Dehkhoda and Farhang-e Bozorg-e Sokhan dictionaries, is associated primarily with negative connotations and includes the following definitions:

- The left side, the western direction when facing north (opposite of right).
- In the realm of politics, "left" refers to individuals and groups espousing liberal views and advocating progressive reforms.
- Enemy.
- Pocket.
- Strabismus (crossed eyes).
- Looking at someone with hostility, anger, or ill intentions.
- To redirect or avoid someone, ignoring their presence.

- Deformed.
- Loss of balance, resulting in overturning.
- Crooked, bent, or lopsided.

2-3-3 Politics

The words "rɒst" and "ʧæp" in Persian, like in other languages, have political meanings that originated during the French Revolution in 1789. During this time, members of the National Assembly were divided into supporters of the regime on the right side and supporters of the revolution on the left. Since then, the right side in political literature symbolizes conservative views favoring traditional values, while the left side represents liberal ideologies advocating for progressive reforms. These distinctions evolved over the 19th century, with the "right" supporting the status quo and the "left" pushing for social and economic equality. In this study, it is important to note that these political labels are conventional and don't carry positive or negative connotations.

2-4 Persian Linguistic Database

This section aims to explore the connotations of the words "rɒst" and "ʧæp" in Modern Persian literature and provide illustrations of their usage. To achieve this goal, the Persian Linguistic Database (PLDB) is utilized. The PLDB is the first online database for contemporary (Modern) Persian, developed by the Institute for Humanities and Cultural Studies (IHCS) in Tehran, Iran. This corpus contains extensive collections of various forms of Modern Persian, which facilitates searches for distinct words in corpus texts and offers sentences highlighting those words.

Searching the words 'rɒst' and 'ʧæp' in the Persian Linguistic Database resulted in 317 sentences, with 183 containing 'rɒst' and 119 containing 'ʧæp'. These sentences exemplify the literal and metaphorical meanings of 'rɒst' and 'ʧæp' as used in modern Persian literature. In the following, I will categorize and illustrate the different meanings of these words extracted from the corpus.

2-4-1 The Word "*rɒst"* In The Persian Linguistic Database

Of the 186 sentences containing the word "rɒst", 67 convey its directional meaning, and three present a political sense. The remaining sentences utilize "rɒst" metaphorically. The most frequent metaphorical usage of "rɒst" in the corpus denotes truth as opposed to lie, found in 64 sentences. This is evident in the phrase "rɒst-o-doruG" (truth and lie), where "rɒst" (right) is positioned as the antonym of "doruG" (lie).

ʔæz	rɒst-o-doruG-e	Gæzije	xæbær	næ-dɒr-æm
from	right-DOM-lie-EZ	case	information	NEG-have-1SG

I do not know whether it is a truth or a lie.

Moreover, the word "rɒst" appears in 32 instances to signify an upright, straight, and aligned as opposed to bent, tilted, and curved. In the following sentence, the author describes people exercising:

bædæn-hɒ-ʧɒn	rɒ	xæm-o	rɒst	cærd-ænd
body-PL-3SG	DOM	bent-CONJ	right	be-PST-3SG

They bent and straightened their bodies.

In another instance from the corpus, a woman corrects the position of a bar that is not aligned correctly.

mile-je	kuʧæc-i	rɒ	ce	cæm-i	cædʒ	ʃode	bud-Ø	rɒst	cærd-Ø
bar-EZ	small	DOM	that	a little-ADV	tilted	be	be-PST-3SG	right	do-PST-3SG

She straightened a small bar that was slightly tilted.

Furthermore, the word "rɒst" is used in seven sentences in the term "rɒh-e-rɒst" referring to the righteous path and decisions that God would approve of, as the following sentence shows:

bihude	sæʔj	micærd-æm	zæn-e	fɒsed-i	rɒ	be	rɒh-e	rɒst	bi-ʔɒvær-æm
ineffective	try	do-PST-1SG	woman-EZ	slut-INF	DOM	to	path-EZ	right	IMP-bring-1SG

I tried in vain to get a slut back on the righteous path.

Another metaphorical usage of the word "rɒst" involves challenging someone or belittling their achievements. This meaning appears seven times in the corpus, as seen in the example:

ʔæɻe	rɒst	miɻi	hesɒb-e	mæsʔulin	ro	hæc	kon	beriz	tu	hesɒb-e	melæt
if	right	tell	account	officials	DOM	hack	do	deposit	in	account-EZ	people

If you dare, hack the official accounts and transfer their money to the people's accounts.

Additionally, "rɒst" is found three times in the phrase "dæst-e-rɒst" (right hand), which refers to the most trusted person and highlights the importance and reliability of an assistant or confidant. The following sentence is an example:

dær	tæmɒm-e	ʤæŋ-hɒ	dæst-e	rɒst-e	mæn	bud- Ø
in	all- EZ	war-PL	hand- EZ	right- EZ	me	be-PST-3SG

He was my right-hand man in all wars.

Lastly, "rɒst" is used once to indicate something real, as opposed to fake. In the following example from a novel, a character describes a gun as real, distinguishing it from a simple toy.

tofæŋ-e	rɒst-rɒst-i	bud-Ø	næ	ʔæz	ʔin	tofaŋ-ɒ
gun- EZ	right-right-ADJ	be-PST-3SG	NEG	from	these	gun-PL

It was a real gun, not like these fakes.

2-4-2 The Word "ʧæp" In The Persian Linguistic Database

The word "ʧæp" appeared in 112 sentences. It was used 93 times to denote the literal meaning of the left side of space. Additionally, it was employed once in a political context.

The term "ʧeʃm-e-ʧæp" appeared six times in the corpus, referring to a condition where the eyes are misaligned and fail to coordinate appropriately. For example, the following sentence from the corpus describes a man with strabismus.

ʧeʃm-ɒn-e	mehdibæGɒl	ʧæp	ʔæst
eye-PL-EZ	MehdibaGɒl	left	be-3SG

MehdibaGɒl is cross-eyed.

Moreover, the word "ʧæp" appeared five times in the corpus in different terms to convey feelings of harassment and annoyance. For instance, the phrase 'negah-e-left', which translates as 'looking left to someone', signifies the act of annoying or troubling someone.

diɟær	cæs-i	ne-mitævɒn-æd	be	mæn	ʧæp	negɒh	conæd
anymore	one-INF	NEG-can-3SG	to	me	left	look	do-3SG

No one can bother me anymore.

Also, the term "ʧæp-ʧæp," which translates to "left-left," denotes a side-eye look or skeptical glance, as the following example demonstrates.

ʧæp	ʧæp	be	suræt-e	ʔu	xire	ʃod-Ø
left	left	to	face-EZ	him	stare	be-PS-3SG

He kept giving him the side-eye.

The idiom 'be kuʧe ʔæli ʧæp zædæn', which translates as 'going to the Ali left alley,' metaphorically means looking the other way or avoiding uncomfortable information or questions. This phrase is evident in five sentences within the corpus. In the following sentence, the speaker accuses his audience of attempting to evade the subject.

ʔæɟær	Gærɒr	bɒʃ-æd	be	kuʧe	ʔæli	ʧæp	bezænin
if	intention	be	to	allay	Ali	left	Do-PL-3SG

It seems that you intend to evade the main issue.

The idiom "*xɒb-e zæn ʧæpe"*, which translates to 'the women's dreams are left,' occurred twice in the corpus. This idiom conveys the meaning that women's dreams are often unfulfilled. In the following example, a character from the novel recalls a meeting where the topic of dreams was discussed.

sohbæt	ʔæz	ʧæp-o	rɒst	budæn-e	xɒb-e	zæn-o	mærd	ʃod-Ø
talk	about	false-CONJ	true	be-EZ	dream-EZ	woman-CONJ	man	be-PST-3SG

There was talk of men's and women's dreams coming true and false.

The findings of exploring the Persian Linguistic Database corpus align with the results of Schiefenhövel (2013). Sentences extracted from the corpus containing the words "rɒst" consistently demonstrate its positive connotations, never appearing in a negative context. Conversely, the word "ʧæp" is consistently used in a negative sense in the Persian language, with no instances of positive connotations found in the corpus. In sum, while

both words are utilized in their literal and political senses, their metaphorical meanings exhibit distinct patterns. The metaphorical connotations of "rɒst" tend to be positive, whereas those of "ʧæp" predominantly carry negative implications.

Chapter 3: A Comparative Analysis Of Valence Associated With The Words For The Right And Left Sides In Persian And English Using Twitter Data

3-1 Introduction

Chapter 2 discussed the meanings and connotations of the words "rɒst" and "ʧæp" based on dictionaries and Persian corpus data. It was found that "rɒst" tends to evoke positive concepts while "ʧæp" is more associated with negative concepts in Persian. This pattern in Persian aligns with the trend observed in other languages, where positive concepts are commonly linked to the right side and negative concepts to the left side. The present study compares a language with a very strong space-valence association with a language lacking this association. The assumption is that Persian entails a much stronger space-valence association than English, which is extensively studied in the body-specificity hypothesis. Therefore, the present chapter conducted a comparative sampling study to compare the valence of words right and left between the Persian and English languages. The primary aim of this sampling study is to investigate whether Persian exhibits a stronger association between the right side and positive concepts, as well as the left side and negative concepts, compared to English.

3-2 Method

The method involved collecting a dataset from Twitter, a widely used social media

platform for text-based communication. According to data from www.statista.com, the ages of most Twitter users are between 25 and 34, making it a significant source for observing contemporary linguistic trends. The dataset for this study comprises 4,000 tweets, carefully labeled to categorize the emotional valence conveyed by the target words.

For this sampling study, 2,000 tweets were collected for each language: Persian and English. Tweets contained the words "rɒst" or "ʧæp" in Persian and the words "right" or "left" in English.

For both Persian and English datasets, a similar approach was taken to collect relevant tweets over the same one-month period. Duplicate, retweeted, and quoted tweets were removed. The datasets consisted of informal conversational tweets in their respective languages. We randomly selected 50 tweets per day for each target word using the R programming language, resulting in 1,500 tweets for each word. From this initial pool, 1,000 tweets were randomly selected for each target word from each language, resulting in a dataset of 4,000 tweets.

Each language had two reviewers who independently reviewed and classified all tweets based on the emotional valence of target words. Tweets were categorized as positive, negative, or neutral solely based on the meaning of the target word.

It's crucial to note that this research doesn't involve semantic analysis but rather focuses on determining the emotional valence of the target words and comparing them across languages. During the review process, reviewers may have had differing opinions about the exact meaning of the target words since determining a precise definition of the target word within a sentence was challenging, and the word may have multiple meanings. Nevertheless, they consistently agreed on whether the word conveyed a positive or

negative emotional valence. Based on their metaphorical meanings, the target words are classified into three categories: positive, negative, and neutral. Below, I will ellaborate each valence category with examples.

3-2-1 Category 1: Positive Valence

The collected dataset comprises 1000 tweets with the word "rɒst" and 1000 tweets with the word "ʧæp" in Persian, as well as 1000 tweets with the word "right" and 1000 tweets with the word "left" in English. Interestingly, the Persian word "ʧæp" and its English equivalent "left" are not found to be used in a positive metaphorical context in the collected dataset. However, 46.3% of the instances of the word "right" in English and 68.1% of the occurrences of the word "rɒst" in Persian are used in a metaphorical positive context. Here, I will elaborate on the most frequent positive concepts that "right"/"rɒst" carry in each language.

3-2-1-1 English Tweets

In the English Twitter dataset, the word "right" has often been used to convey the meaning of "fact or truth" or "correct," contrasting with "wrong." In such instances, the target word valence was considered positive. An example of this meaning is as follows:

"Wrong is wrong, even if everyone is doing it. Right is right, even if no one is doing it".

Furthermore, the word "right" commonly appeared as a tag question in the English Twitter dataset. In this scenario, "right" was used to request confirmation of a statement. Individuals may want to verify the accuracy of what they have just said or to ensure their message has been received and acknowledged. In these cases, the word "right" can be

approximately replaced with the word "correct". Therefore, this metaphorical meaning of "right" was classified as having a positive valence. The following tweet demonstrates this usage:

"Being lonely and surrounded by loneliness doesn't sound fun, right?"

Another frequent meaning of the word "right" was "good" or "well." This meaning, which was considered positive-valenced, includes expressions such as "feel right" and "fit right," as demonstrated in the following tweet:

"When shit ain't going right you just gotta sit back and think shit can be worse"

Furthermore, as exemplified below, another meaning of the word "right" was "propriety" and "suitability," which was also regarded with a positive valence:

"Choosing the right video system also offers an approach to saving energy"

In the Twitter dataset, the word 'right' was commonly employed to assert claims or titles within legal, social, moral, or ethical contexts. In these instances, 'right' conveyed a sense of authority or privilege. Additionally, it was used to imply being 'deserving' of specific treatment or entitlement, which was considered a positive valence in this study. An illustrative tweet from the dataset exemplifies this usage:

"You have every right to vengeance, and I'm offering you the means to have it. Curse them, my dear".

3-2-1-2 Persian Tweets

The most frequent metaphorical meaning of the word 'rɒst' in Persian database was 'truth,' as opposed to 'lie.' The phrase 'rɒst-o-doruG' (right-CONJ-lie) clearly illustrates the polarity between the concepts of 'right' and 'lie' in Persian. In this context, the word 'rɒst' carries a positive valence, as exemplified by the following tweet:

kɒr-næ-dɒr-æm	ci	rɒst	mi-ɟ-e	ci	doruG
Deal_NEG_have_1SG	who	right	PROG-say-3SG	who	lie

I don't care who is telling the truth and who is lying.

Also, the phrase 'rɒst goftæn' was frequently used in Persian tweets to confirm widely held public beliefs or popular opinions. This meaning, as demonstrated in the following tweet, was considered to have a positive valence.

vɒGeʔæn	rɒst	mi-ɟæn	tæhsilɒt	ʃoʔur	Ne-mijɒre
really	right	PROG-tell-3SG	education		NEG-come-3SG

It is really true that school cannot teach you common sense.

Another metaphorical usage of the word "rɒst" was found as an adjective modifying the word "rɒh" (path), indicating a correct and righteous path that leads to good and moral behavior. In the following tweet, a user expresses a wish for everyone to be guided towards the right path by God. This metaphorical usage was considered positive-valenced.

xodɒ	hæmæ-ro	be	rɒh-e	rɒst	hedɒjæt	Kon-e
God	everyone-DOM	to	path-EZ	right	guid	do-3SG

May God guide everyone to the right path.

The word 'rɒst' was also used in Persian tweets to describe speaking directly and clearly without hesitation or reservation. The word 'right' as an adjective or adverb means 'honest(ly)', which was considered to have a positive valence. For instance, in the following tweet, the user expresses his frustration directly.

tæsmim	dɒʃtæm	mostæGim	rɒst	beɟæm	ce	nɒrɒhæt	ʃodæm
decision	have-PST-1ST	direct	right	say-1ST	that	upset	be-PST-1SG

I decided to say clearly that I was upset.

In addition, the word "rɒst" was used in Persian tweets to mean standing straight with the body, metaphorically expressing success, pride, and triumph. The following tweet states

that after Ferguson's retirement, the Manchester football team could not achieve the same level of success and glory as before.

bæʔdæz	Ferguson	Manchester	cæmær	rɒst	næ-cærd-Ø
after	Ferguson	Manchester	back	right	NEG-do-PST-3SG

After Ferguson, the Manchester team did not recover.

3-2-2 Category 2: Negative Valence

In this dataset, no negative meaning was found for the word denoting the right side of space in both English and Persian. Furthermore, the dataset yielded no negative meanings for the word 'left' in English. However, the Persian word 'ʧæp' has been observed to carry various negative connotations in 66.5% of its metaphorical meanings. These negative connotations will be demonstrated through the following examples.

The word "ʧæp" has been frequently used in the database in the phrase "ʧæp negɒh cærdæn," which translates to "looking left at someone." This phrase indicates the act of intentionally causing harm to others or disturbing them. For instance, the following tweet expresses the user's emotions when their family is bothered.

jec-i	ʧæp	negɒ-ʃun	kone	vɒGeʔæn	hers-i	miʃ-æm
someone-DEF	left	look-them	do-3SG	really	angry-ADJ	be-1SG

I get furious if someone bothers them.

Also, the word "ʧæp" has been frequently used in Persian tweets to convey the concept of enmity or hostility. Being "ʧæp" with someone metaphorically conveys strong negative feelings towards them. For instance, in the following tweet, the user expresses strong hate and hostility toward the persons he is "ʧæp" with.

ʔæɟe	bɒ	Jec-i	ʧæp	konæm	xodɒ	hæm	ne-mitune	nedʒɒt-eʃ	bede
if	with	someone-DEF	left	do-1SG	God	too	NEG-can-3SG	save-3SG	do-3SG

If I am an enemy to someone, even God cannot save him.

Additionally, the word "ʧæp" is considered to have a negative valence when it appears in the database with the meaning of "overturned" or "fallen." In these cases, "ʧæp" has been used to describe an overturned car, a fallen frying pan, or a collapsed tower, as illustrated in the tweet below.

xɒb	did-æm	bordʒ-e	milad	ʧæp	ʃod-Ø
dream	see-PST-1SG	tower	Milad	left	be-PST-3SG

I dreamed that the Milad Tower fell over.

Moreover, the word "ʧæp" was considered to have a negative valence when used in the metaphor 'waking up from the left rib' in the Persian tweets. This phrase conveys being

in a bad mood. For example, a user in the following tweets describes their bad mood, which continued from the last night to the following day.

mæn	ʔemruz	ʔæz	dænde-je	ʧæp	bidɒr	næ-ʃod-æm	bɒ	hæmun	dænde	xɒbid-æm
I	today	from	rib-EZ	left	awake	NEG-be-1SG	with	same	rib	sleep-1SG

I did not wake up on the wrong side of the bed today. I was sleeping on the same side.

Also in the Persian tweets, the word "ʧæp" was used to describe an uneven, asymmetrical body, face, and particularly imbalanced eyes, such as the medical condition known as 'lazy eye.' For instance, in the following tweet, the user expresses concern that her eyes don't appear symmetrical in a specific photo.

ʔehsɒs-mikonæm	tu-je	heder-æm	ʧeʃ-æm	ʧæp	ʔoftɒd-e
feel-do-1ST	in-EZ	header photo-mine	eye-mine	left	be-3SG

In my header photo, it looks like I have a lazy eye.

Furthermore, the word "ʧæp" in Persian tweets has been repeatedly used in the phrase "toxm-e ʧæp," which translates to "left ball (testicle)". This phrase was used by both male and female users to refer to something or someone worthless and to humiliate and insult them. It is interesting to note that some users replace the noun "toxm" with other bodily organ names to reduce the insolence of the sentence and remain polite. In some cases, they simply delete the word "toxm," but the word "ʧæp" has always remained to indicate the worthless and negative sense of the situation. The user in the following tweet criticizes

individuals who overshare their daily life details on social media, emphasizing that nobody cares about such updates.

ruzmærejɪ-ha-je	ʃomɒ	be	ʧæp-e	cæsi	nist
Daily activities	you	to	left-EZ	someone	NEG-3SG

Your daily activities do not matter to anyone.

The word "ʧæp" also once appeared in a tweet, denoting sad music. This tweet refers to a dried lake, where a symbolic mourning ceremony was held, and musicians played a funeral march. In some areas of Iran, playing music in a mourning ceremony is called "ʧæp zædæn." This metaphorical meaning was considered to have a negative valence by reviewers.

bærɒ-je	xoʃc	ʃod-æn-e	ʧeʃme-je	kuhrænɻ	sɒz-e	ʧæp	mizænæn
for-EZ	dry	be-INF-EZ	spring-EZ	Kouhrang	musical instrument-EZ	left	play-3SG

They play the dead march music for the dried spring.

3-2-3 Category 3: Neutral Valence

The most neutral valence of directional words in both Persian and English tweets was their literal meanings as directions in space. Additionally, these words were frequently

used in their political meanings in both Persian and English tweets. Considering the historical origin of their political meanings, they are not inherently tied to specific political values but are entirely arbitrary. Therefore, this study considered the political meanings of directional words as neutral valence.

Another situation where target words were considered neutral-valenced was the terms "left and right" in English and "ʧæp-o-rɒst" in Persian tweets. These phrases use directional words together to describe actions or events that occur continuously, frequently, or without a discernible pattern or specific direction.

The following tweet from the English dataset demonstrates how the words "right" or "left" hold no individual significance, but rather, the phrase conveys a metaphorical meaning of 'frequently'.

I just be liking people stories left and right

Similarly, in Persian tweets, the phrase "rɒst-o-ʧæp" is used to convey repetition and continuity, as seen in the following tweet where the user expresses frustration with the daily occurrence of their phone ringing frequently.

ʧæp-o- rɒst	guʃi-m	zæŋ-mixore
left-CONJ-right	phone-1SG	ring-3SG

My phone keeps ringing.

Besides these common metaphorical meanings shared by both languages, some were specific to each language. The word "ʧæp" in Persian data has not been evaluated as having neutral valence in any other context. However, the words "left" and "right" in English tweets, as well as the word "rɒst" in Persian tweets, exhibited more neutral valence meanings, which will be illustrated with the following examples.

3-2-3-1 English Tweets

In English tweets, the word "left" frequently appeared as the past tense of the verb 'leave' or as a noun or adjective in the form of 'leftover'. In these instances, the word "left" is not a directional word and does not convey an inherent value. Therefore, this occurrence of the word is considered neutral in this study.

Furthermore, the most prevalent meaning of the word "right" in English was as an adverb, denoting "precisely" to emphasize the exact location, position, or time of something. In these cases, the word "right" neither conveys a positive nor negative nature but was instead considered neutral-valenced. For example:

More Canadians are travelling to Toronto than anywhere else in the world right now

3-2-3-2 Persian Tweets

In Persian tweets, the word 'rɒst' is frequently used to describe the state of a man's erection. For example, in the following tweet, 'rɒst' is used as an adjective to depict the rigid condition of male genitalia.

ʧɛrɒ sobh rɒst mi-ʃe

why morning erect PROG-be-3SG

Why does it get hard in the morning?

In this case, the metaphorical use of 'rɒst' does not inherently carry positive or negative connotations. Instead, it simply expresses a physical reality without any evaluative judgment. Therefore, this study considered this particular meaning of 'rɒst' to have a neutral valence.

Interestingly, Twitter data has revealed that this metaphorical meaning of the word "rɒst" has expanded beyond its original meaning of sexual arousal to encompass various emotions that apply to both genders. As the following tweet shows, "rɒst" is metaphorically used to convey a hacker's determination and passion.

hæcer-e rɒst cærd-Ø hæc kone

hacker-DEF right do-PST-3SG hack do-3SG

The hacker wanted to hack the gas station.

This new and extended meaning of "rɒst" has not been documented in dictionaries or detected in corpora, indicating it is a new trend in the language. This particular meaning of "rɒst" was considered neutral in this study since it neither leans towards a positive nor a negative valence. Instead, it denotes evoking any form of emotion or desire, regardless of its valence. In other words, this metaphor describes a state of strong determination or passion without inherently implying whether the emotion is favorable or unfavorable.

3-3 Results

This study compared the valence of the words "right" and "left" in English with the words "rɒst" and "ʧæp" in Persian among 4,000 randomly selected tweets. All words exhibited both literal and metaphorical meanings. The literal and political meanings were excluded, and the metaphorical meanings were carefully reviewed and categorized according to their valence. This section will analyze and visually represent the outcomes of comparing the metaphorical meanings of these words between the two languages.

3-3-1 Comparing The Word *"right"* In English And The Word *"rɒst"* In Persian

The results of the sampling study on Twitter show that neither "rɒst" in Persian nor "right" in English carries a negative metaphorical connotation.

In Persian tweets, approximately 87.1% of the metaphorical meanings of the word "rɒst" have a positive valence, while 12.9% are neutral. The result of the Binomial test shows a strong statistical significance between positive and neutral meanings in Persian (p-value < 0.0001), indicating that the word "rɒst" is significantly employed in a positive valence rather than a neutral one.

In English tweets, 50.6% of the metaphorical meanings of the word "right" have a positive valence, while 49.4% are neutral. The Binomial test reveals that the frequency of positive and neutral valences for the word "right" in English is not statistically significant (p-value $= 0.741$).

Furthermore, comparing the frequency of positive valence between Persian and English reveals that the word "rɒst" in Persian significantly exhibits positive valence more

frequently than "right" in English. The result of Fisher's exact test indicates that the odds of "rɒst" having a positive meaning in Persian are 6.6 times greater than the odds of "right" having a positive meaning in English (p-value < 0.0001, with a 95% confidence interval of (5.1, 8.5)

In Figure 3.1, the valence of the word "rɒst" in Persian is compared with the valence of the word "right" in English.

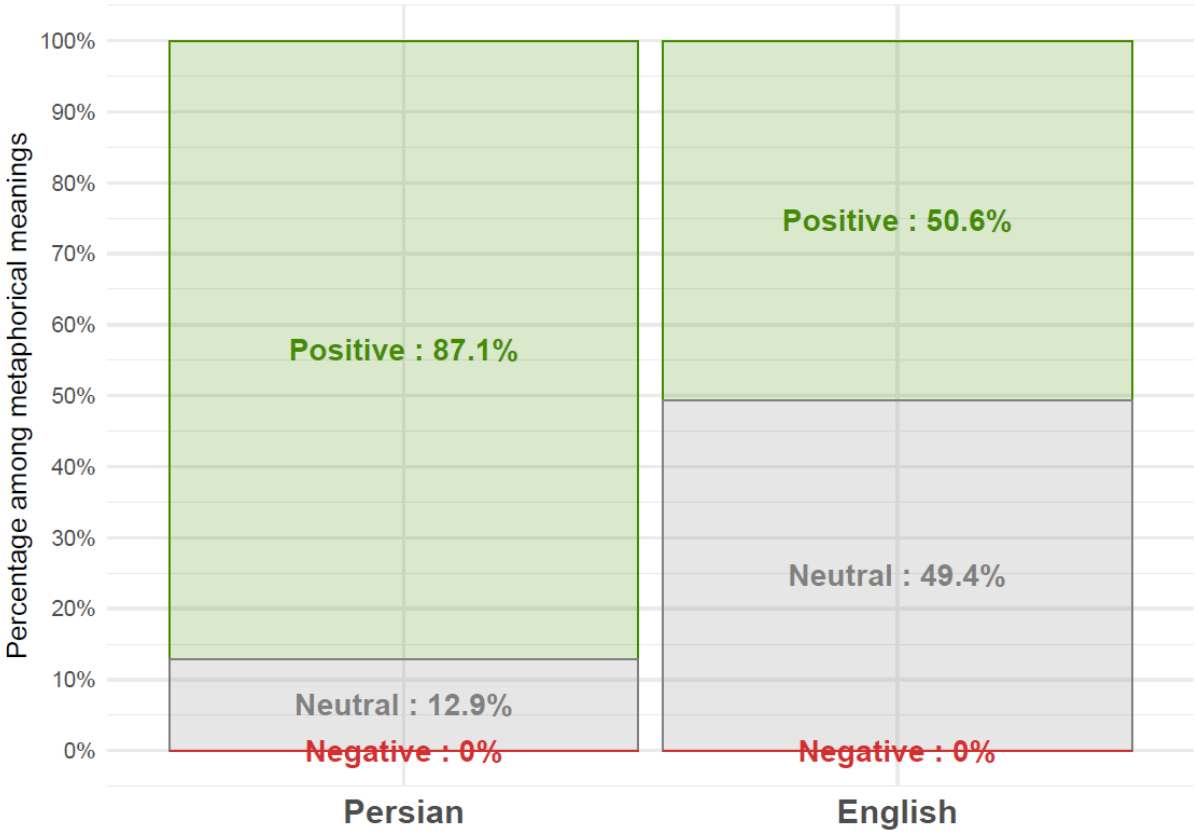


Figure 3.1: Comparing the valence of the word "rɒst" in Persian and the word "right" in English languages.

3-3-2 Comparing The Word *"left"* In English And The Word *"ʧæp"* In Persian

The results of the Twitter study indicate that neither the word "ʧæp" in Persian nor "left" in English tweets appeared with a positive valence.

The findings show that all metaphorical meanings of "left" in English tweets carry a neutral valence. Conversely, among Persian tweets, 66.5% of the metaphorical meanings of "ʧæp" had a negative valence, while 33.5% had a neutral valence. The Binomial test reveals a significant difference between negative and neutral valence for the word "ʧæp" in Persian (p-value < 0.0001), suggesting that "ʧæp" is significantly more frequently used in a negative valence than a neutral one.

Furthermore, comparing the negative valence between the words "left" and "ʧæp" shows that Persian tweets have a significant preference for associating the word for the left side with negative valence, while this relationship is not observed in English tweets (p-value < 0.0001).

Figure 3.2 provides a comparison of the valence of the word "left" in English and the word "ʧæp" in Persian.

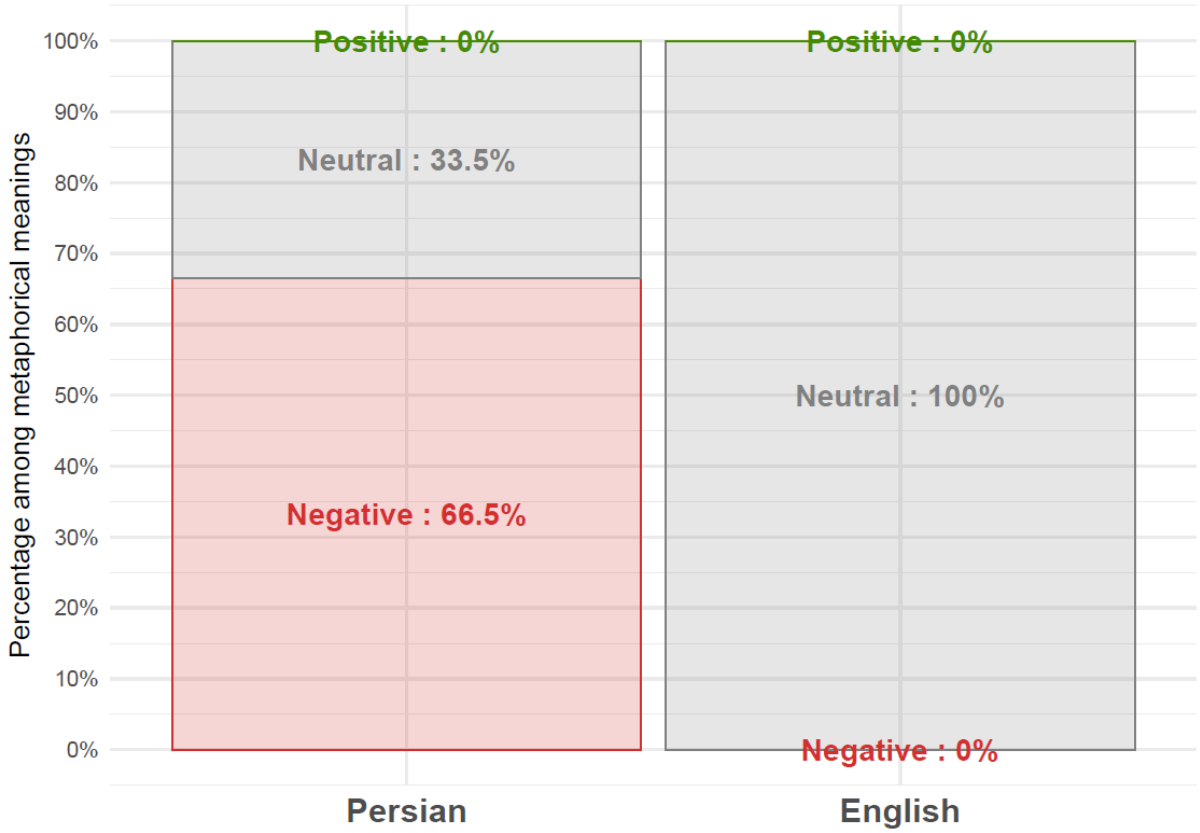


Figure 3.2: The metaphorical meanings of the word "ʧæp" in Persian and the word "left" in English languages.

In summary, the analysis of a randomly selected sample of 4000 tweets revealed that both languages tend to attribute positive valence to words representing the right side of space. However, this preference is significantly more pronounced in Persian than in English. Conversely, the Persian language demonstrates a strong association between negative valence and the word representing the left side of space, while this association was not observed in English. Furthermore, the results did not show any positive valence for words representing the left side of space or negative valence for words representing the right side of space in either language.

Chapter 4: Sign Language

4-1 Introduction

It is well-documented in spoken languages that there is a tendency to associate positive valence with the right side of space and negative valence with the left side. However, the results of the Twitter study in Chapter 3 showed a stronger preference for this association in Persian compared to English. This chapter will discuss the association between lateral space and valence in sign languages, specifically emphasizing Persian Sign Language. Moreover, it will compare the spatial metaphors in Persian language with those in Persian Sign Language to explore whether Persian Sign Language employs signs for the right and left sides of space similarly to Persian spoken language using words for the right and left sides to express metaphors.

4-2 Metaphors In Sign Languages

Sign languages are natural human languages acquired and used by deaf communities. Unlike spoken languages, which rely on speech articulators to produce sounds, sign languages use the body, face, and particularly the hands to convey meaning. Therefore, sign language is considered a visual-spatial modality (Kaneko & Sutton-Spence, 2016). Since Lakoff and Johnson introduced conceptual metaphor theory, many studies have investigated conceptual metaphors in sign languages. The central idea of conceptual metaphor theory, which posits that people understand and express one domain in terms of another, also extends to sign languages.

Taub (2001) applied the conceptual metaphor theory framework to sign languages, exploring the relationship between iconicity and metaphor in her seminal book "Language in the Body: Iconicity and Metaphor in American Sign Language". She demonstrated that many conceptual metaphors observed in spoken languages are also present in sign languages. The presence of the same metaphors in both spoken and sign languages suggests that deaf individuals conceptualize the world in much the same way hearing people do (Wilbur, 1987; Wilcox, 2000; Taub, 2001; Roush, 2011).

This study is particularly interested in spatial metaphors and aims to compare them between spoken and sign languages. According to the conceptual metaphor theory, the metaphors GOOD IS UP/RIGHT and BAD IS DOWN/LEFT are rooted in our interactions with the world. These metaphors give rise to linguistic expressions such as "high social class", "feeling down", "right-hand man", and "two left feet", which have been extensively studied in various spoken languages. Taub (2001) argues that sign languages, like spoken languages, have a metaphorical mapping for GOOD IS UP. The spatial metaphors "up is good" and "bad is down" have been observed in multiple sign languages. (Taub 2001; Marschark, 2004; Tobin, 2008; _Sutton-Spence, 2010; Kaneko & Sutton-Spence 2012; Roush, 2016; Nilsson, 2016; YAP, 2018).

While words in spoken languages are conventional signs that indicate the relationship between signifiers and signifieds and have no inherent spatial value, signs in sign languages can be expressed in three-dimensional space. Consequently, sign languages can use signs in selected locations to represent spatial metaphors, unlike spoken languages.

Marschark (2004) suggested that an increase in goodness correlates with an upward movement. According to him, happiness, value, quantity, and dignity are made either on the up space or with upward movements.

Taub (2001) discussed that the top end of the vertical scale is associated with positive values, while the low end is associated with negative values. Therefore, higher locations on the vertical space present being better and moving upward corresponds to progress and improvement.

Yap et al. (2014) investigated the "good is up" metaphor in three sign languages. The study involved comparing the vertical hand movements of signs with the valence of their English equivalents. The results indicated that signs with upward movements had the most positive valence, whereas those with downward movements conveyed the most negative valence. Signs with non-vertical movements were found to be intermediate in valence. They concluded that signs' vertical direction predicts their valence.

Sutton-Spence and Aneko (2007) discussed that, unlike the vertical axis, the left-right axis is not metaphorically involved in expressing valence. They stated that no evidence suggests that sign languages or sign language poetry utilize the right or left sides of space to symbolize positive or negative concepts.

Börstell and Lepic (2020) conducted a study investigating sign locations in 776 signs across 27 sign languages. Initially, they compiled a list of 41 antonym concepts and categorized each pair member based on positive or negative valence. Then, they provided videos of signs corresponding to these concepts using a sign language dictionary. Their analysis focused on hand movements along the vertical (upward/downward) and sagittal (inward/outward) axes. The results revealed a significant association between upward and outward movements in signs and positive concepts, while downward and inward movements were associated with negative ones. However, they excluded horizontal hand movements from their study. According to them, signs may move side-to-side or involve a mirrored converging/diverging movement for two-handed signs, neither of which can easily be categorized as having a directional movement. Furthermore, the lateral axis is

subject to mirroring based on signer handedness, meaning that a rightward movement for a right-handed signer is typically a leftward movement for a left-handed signer. They decided to discard the horizontal axis because few signs appeared to use the lateral axis like the other two axes.

Other sign language researchers also believe that the lateral axis does not create spatial metaphors (Johnston & Schembri, 2007; Calbris, 2008; Sutton-Spence, 2010; Börstell & Lepic, 2020). Sutton-Spence (2016) stated: "*good is on the right" is not commonly observed in sign languages because the bilateral symmetry of the body and the handedness of signers make left-right distinctions in sign languages unproductive metaphorically"*.

The absence of association between lateral space and valence in sign languages is attributed to the prevalent use of the dominant hand for signing. Research indicates that sign language users favor one hand for signing activities. The signer's handedness influences the choice of which hand is more active in sign production. Fenlon et al. (2019) argued that the dominant hand is primarily responsible for articulating one-handed signs and serves as the active hand in two-handed signs, with the other hand commonly known as the subordinate hand. The active hand, typically the dominant hand, is subject to mirroring based on the signer's handedness, so distinguishing between rightward and leftward movements of signs is difficult.

To summarize, the vertical axis in sign languages is associated with valence and is often used to represent positive or negative concepts by placing signs at different heights. On the other hand, the horizontal axis is considered less relevant for the metaphorical mapping of valence due to the symmetrical shape of the body and the mirroring effect of handedness.

4-3 Persian Sign Language

The manual language utilized by the deaf community in Iran is known as Persian Sign language[3]. Comparing Persian Sign Language with spoken Persian provides a unique opportunity to investigate how linguistic patterns shape conceptual metaphors. Persian speakers and Persian Sign Language users share similar cultures, making it possible to control cultural influence. Additionally, both groups have similar bodily experiences. Therefore, comparing Persian speakers and Persian Sign Language users will isolate the effects of language from those of the body and culture, allowing us to explore how linguistic conventions affect the association between space and valence.

As previously discussed, sign language studies suggest that sign languages do not use the lateral axis to produce metaphors. This chapter aims to explore whether Persian Sign Language associates positive/negative valence to signs for right and left sides in a similar way to how the Persian language associates them with words *rɒst* and *ʧæp*.

4-3-1 Method

The results of the Twitter study in Chapter Three revealed diverse metaphorical meanings for the words "rɒst" and "ʧæp" in Persian. For this chapter, five proficient Persian Sign Language interpreters were tasked with translating selected sentences into sign language. These sentences were extracted from the Twitter study and included the metaphorical meanings identified for the words "rɒst" and "ʧæp" with positive, negative, and neutral valence. Three interpreters were specialists in Persian Sign Language who worked in the

[3] Also referred to as Iranian Sign Language, Farsi Sign Language, and Zaban Eshareh Irani, Esharani (proposed by Guity(2022))

Iranian Deaf Association, while the other two were bilingual sign language users whose primary language was Persian.

The translation sessions were recorded. For confidentiality reasons, the original videos are not included in this manuscript. Instead, the videos were edited to isolate the signs corresponding to the target metaphors. These videos were converted into consecutive images, which were then transformed into sketches using Lightroom software and the PicsArt application. Finally, the sketched images were combined to reconstruct the signs, illustrating how Persian Sign Language conveys the metaphorical connotations of the Persian words "rɒst" and "ʧæp. These animated images are available in the supplementary material.

4-3-2 Results

4-3-2-1 Horizontal Axis

The results of the Twitter study demonstrate that the Persian language utilizes the word "rɒst" in various metaphorical contexts, most of which have a positive connotation. The following animations illustrate how Persian Sign Language users depict the most common metaphorical meanings of the word *rɒst*. One of the most common metaphorical meanings of "rɒst" in Persian is "truth", signifying correctness as the opposite of lie or incorrectness. In Persian Sign Language, the sign for truth is typically performed by raising the dominant hand with the palm facing upwards while the other hand gently touches or slides over the dominant hand (See Figure 4-1).

Figure 4.1: Sign for "Truth" in Persian Sign Language (version 1)

Alternatively, the sign for truth can be expressed solely with one hand raised, palm facing upwards. In Figure 4.2, the person demonstrates the sign for 'truth' in Persian Sign Language by raising his non-dominant hand, the left hand, with the palm facing upwards. It's worth noting that both hands can be used interchangeably to produce this sign with precisely the same meaning. This sign is not only associated with the concept of truth g but also represents the idea of honesty.

Figure 4.2: Sign for "Truth" in Persian Sign Language (version 2)

Moreover, the phrase 'rɒhe-e-rɒst,' meaning 'right path,' is a frequently used metaphor in the Persian language that signifies the moral and ethical way or the path guided by God. This metaphor is also expressed in Persian Sign Language. Figure 4.3 demonstrates how it communicates the concept of 'the right path.' In this sign, both hands are placed in

front of the body, parallel to each other. They move simultaneously away from the body, indicating a specific direction as if tracing a straight line from the body. Unlike the metaphor conveyed by the word "rɒst" in Persian, the sign language metaphor depicts a straight line moving forward without deviating towards the right or left side.

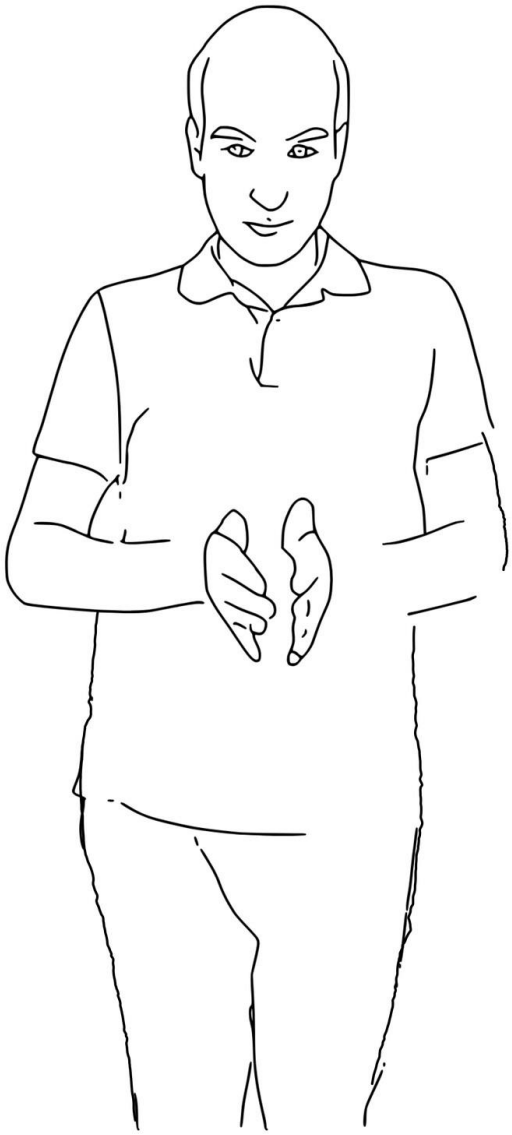


Figure 4.3: Sign for "Right Path" in Persian Sign Language

Another common metaphorical meaning of the word "rɒst" is associated with the rigid and straight position of the male genitalia during an erection. This particular meaning was found to occur very frequently in the Twitter data. In the equivalent sign, as illustrated in Figure 4.4, the dominant hand is raised vertically with the fist clenched up to chest level, while the elbow is bent. Simultaneously, the other hand lies flat on the chest with its palm positioned under the elbow of the dominant hand.

Figure 4.4: Sign for "Sexual erection" in Persian Sign Language

Conversely to the word "rɒst", the word "ʧæp" is strongly related to the negative concepts in Persian. One of its frequent metaphorical uses is the condition in which one's eyes are crossed or strabismus. This condition can cause one or both eyes to turn inward, outward, upward, or downward, resulting in poor eye coordination. In Persian Sign Language, the sign for crossed eyes is symmetrical. As shown in Figure 4.5, the signer uses two pointing fingers from each hand to simultaneously point at both eyes. Then, the fingers of both hands cross each other in a mirror-like manner, symbolizing the misalignment or crossing of the eyes.

Figure 4.5: Sign for "Crossed eyes" in Persian Sign Language

Another common metaphorical meaning of the word "ʧæp" in Persian is harassment and hostility. For example, the phrase "negɒh-e ʧæp" (look-EZ left) means hostility, anger, or suspicion towards the individual being looked at. In Persian Sign Language, this meaning is conveyed through a sequence of two signs: firstly, the dominant hand points to the eyes with two fingers, indicating looking at someone, and then the hand clenches into a fist, facing the audience in the opposite direction of the body producing the sign "bad" as demonstrated in Figure 4.6. This sign, created with the dominant hand, expresses the

negative meaning of hostility towards the subject, with no inclination towards either the right or left sides.

Figure 4.6: Sign for "harassment" in Persian Sign Language

In Persian, the word "*ʧɑɔp*" is also used to describe something overturned or flipped over, such as a car overturned due to an accident. In Persian Sign Language, this meaning is conveyed through a sign where the dominant hand starts with the palm facing upward,

and then it is overturned with the palm facing downward, representing the action of flipping or turning over. Figure 4.7 illustrates this sign in Persian Sign Language.

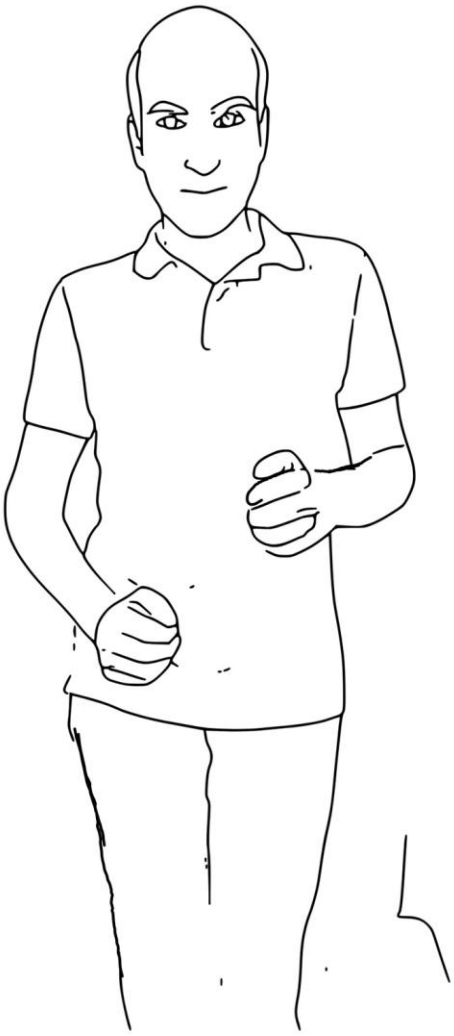


Figure 4.7: Sign for "Rolled-over car" in Persian Sign Language

The word "ʧæp" would also convey the concept of collapsing or falling buildings. In Figure 4.8, the person expresses the idea of a tower falling and getting destroyed. For this sign, the dominant hand starts by going upward vertically from the eyebrow, with the finger pointing upward to represent the height and vertical position of the tower. Then,

the hand bends and becomes horizontal, symbolizing the tower's collapse. Changing the vertical position of the hand to the horizontal position, irrespective of whether it moves to the left or right side, signifies the action of the tower collapsing and being destroyed.

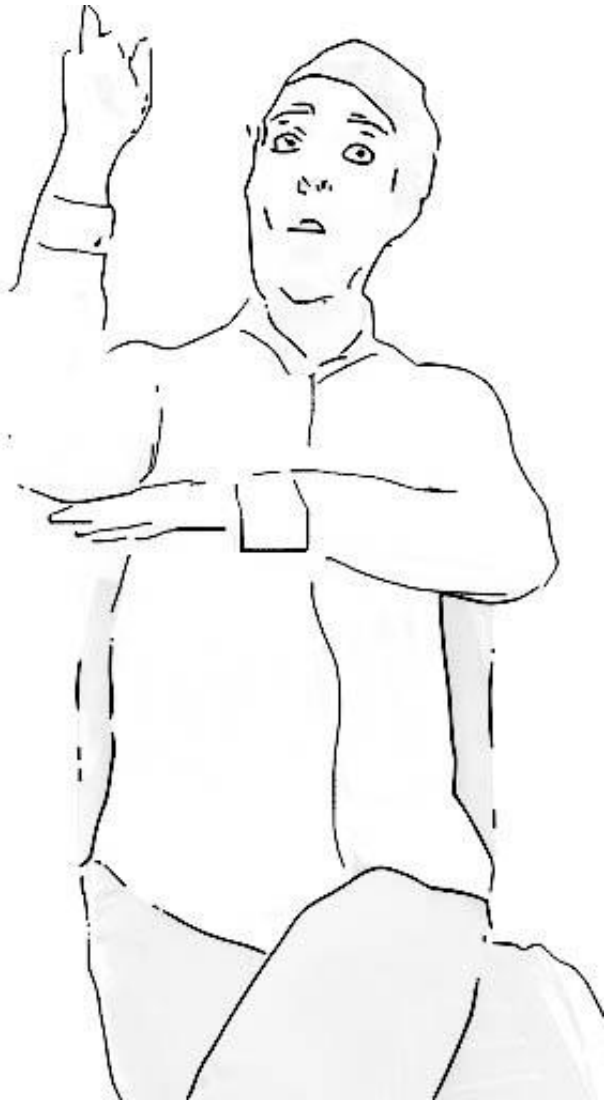


Figure 4.8: Sign for "Falling " in Persian Sign Language

In addition, the Twitter study revealed an informal and impolite expression in Persian where something or someone is referred to as the "left ball" to indicate that it or they are unimportant or not worth paying attention to. There is no direct equivalent sign for this

term in Persian Sign Language, but a similar meaning is conveyed through a specific sign without any association with the right or left side. As Figure 4.9 shows, the signer places the dominant hand's fingers in front of his mouth, simultaneously brings his tongue out, and then moves his fingers away.

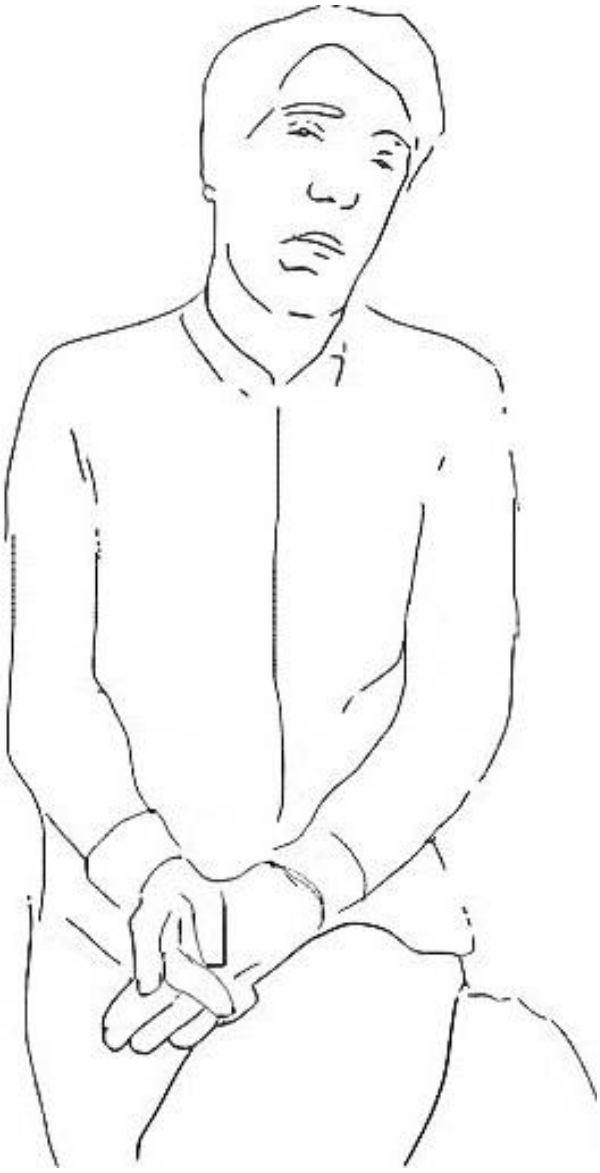


Figure 4.9: Sign for "Insignificant" in Persian Sign Language

In Persian, the phrase 'ʧæp-o rɒst', meaning 'left and right', is a common metaphor conveying repetition and a high frequency of occurrence. This metaphor is used to indicate a significant number or a continuous series of events. This metaphor is also found in the Persian Sign Language. For this sign, the signer raises both hands in a repeating sequence, each representing one side of space (left and right), illustrating the repetition or high number of occurrences. Figure 4.10 shows that the signer begins by closing his fingers near his ear, creating the sign for a telephone. Then, he repeatedly moves his hands to the right and left sides of the space to express the high number of calls.

Figure 4.10: Sign for "Left and Right" in Persian Sign Language

4-3-2-2 Vertical Axis

As illustrated, the metaphorical meanings of the words "right" and "left" in Persian Sign Language are not tied to specific hands or directions. Unlike in the Persian language, where 'right' often represents positive concepts and 'left' represents negative concepts, the signs for 'right' and 'left' directions in sign language remain metaphorically neutral. In other words, the signs for 'right' and 'left' exhibit complete neutrality and do not carry any inherent positive or negative connotations. Additionally, the use of the right or left hand is irrelevant to the meaning, and the dominant hand plays a primary role in expressing the intended meaning.

This observation raises the question of whether spatial signs, in general, are ineffective in conveying valence or whether it is specifically the horizontal axis that lacks valence To address this question, I explored the association between valence and the vertical axis in Persian Sign Language as the control.

The conceptual metaphors "up is good" and "down is bad" have been observed and studied in various languages, considering a universal and widespread pattern. Following the same method used to explore the metaphorical meanings of the words "rɒst" and "ʃæp," the study collected all Persian language tweets containing the words "bɒla" and "pɒjin" posted on Twitter over one month. Subsequently, a total of 1000 tweets for each of the target words were randomly selected from the collected dataset. Two independent reviewers evaluated the valence of the target words within each tweet and categorized them according to their metaphorical meanings. One tweet representing each metaphorical meaning was then selected. Then, the sign language translators translated

the metaphors associated with the words "bɒla" and "pɒjin" into Persian Sign Language. The signs corresponding to these metaphors are presented below.

The word "*bɒlɒ"* (up) in Persian tweets was frequently used to express more and better value. Sign language also employs the sign for the upside to convey the same idea, similar to Persian. Figure 4.11 illustrates the sign for a high score in a sports match. The signer uses two pointing fingers from each hand to indicate the score, and then the hands move upward, conveying the idea that the score is increasing or improving. Similarly, in Figure 4.12, the signer shows gaining an excellent grade in an academic test. In the sign for "good grade," the dominant hand makes the sign for "grade" and then moves upward, locating in a higher position, indicating that the grade is excellent.

Figure 4.11: Sign for "High score" in Persian Sign Language

Figure 4.12: Sign for "Good grades" in Persian Sign Language

Additionally, the word "bplp" is frequently used in Persian tweets to denote getting a

promotion or advancing in rank. This metaphor is also conveyed in Persian Sign Language through an upward movement. The illustrations in Figures 4.13 and 4.14 demonstrate the sign for a high-rank position and the sign for getting a promotion.

Figure 4.13 shows the signer's hand placed above his head, indicating a high status or rank. Similarly, in Figure 4.14, the dominant hand moves upward from a lower position to a location above the head, symbolizing the process of being promoted or attaining a higher position. Using the upward sign to express the positive concept of promotion is consistent with the metaphorical use of the word "bplp" in Persian to convey promotion.

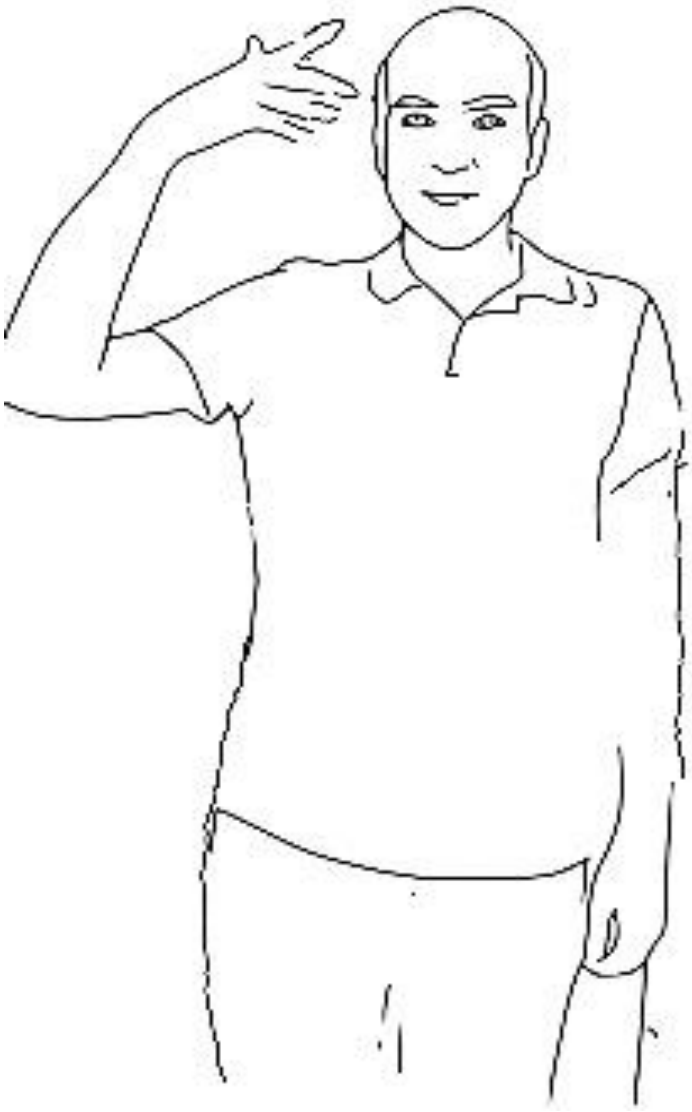


Figure 4.13: Sign for "High-rank position" in Persian Sign Language

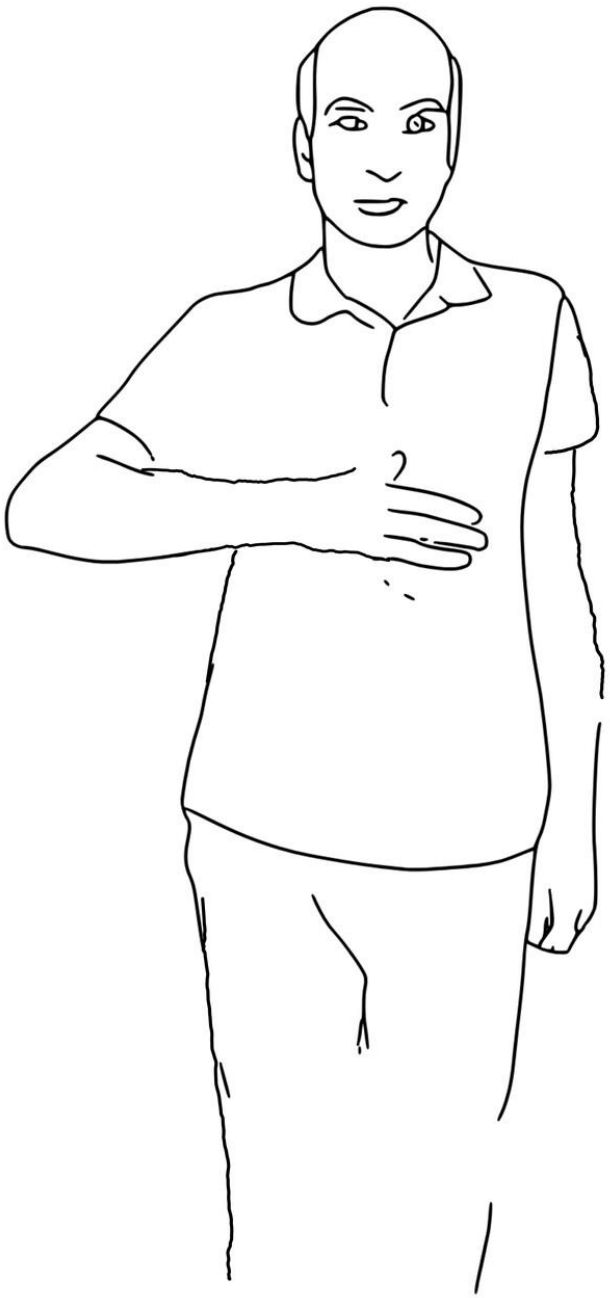


Figure 4.14: Sign for "Promotion" in Persian Sign Language

Furthermore, the word "بولد" was used in Persian tweets as an adjective for concepts related to culture and education, describing individuals as intellectual and highly educated. Similarly, Persian Sign Language utilizes the sign for "up" to convey these metaphorical meanings. In Figure 4.15, the signer starts by bending his fingers and placing them next to his head. Then, the fingers move slightly around the head, symbolizing the concept of culture and intellect. Finally, the signer raises his hand to the upper space of his head, representing the metaphorical concept that the person is intellectual and well-educated.

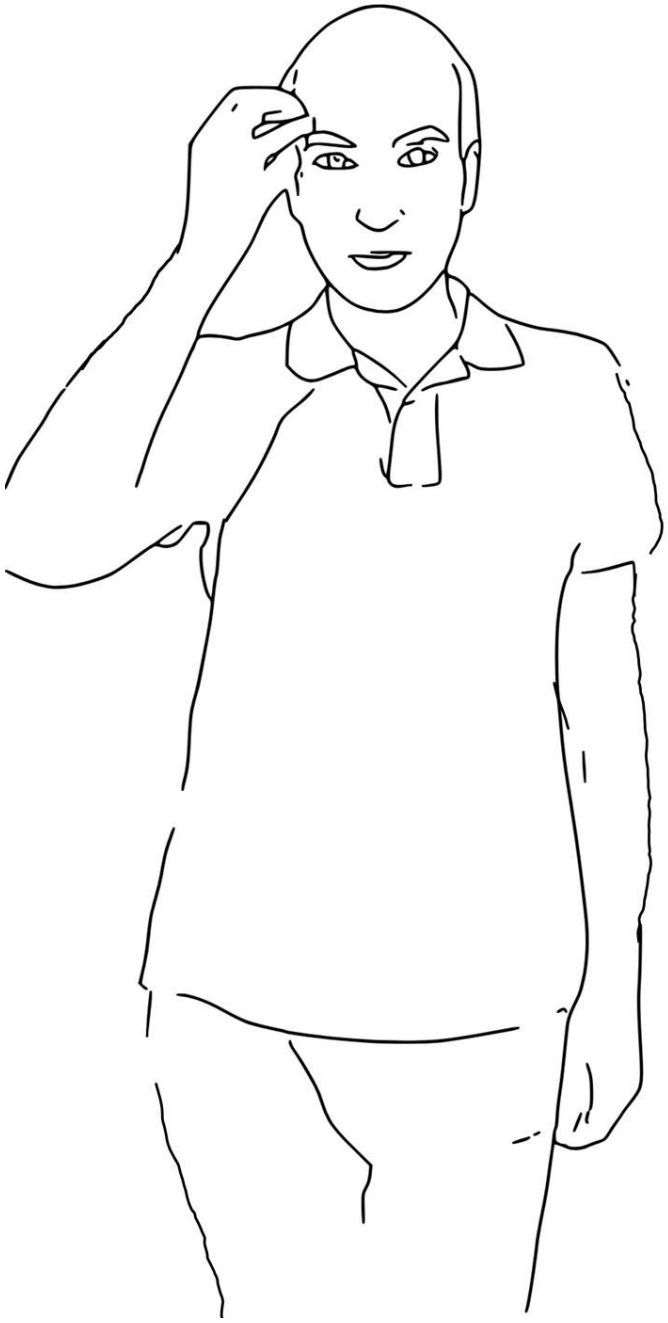


Figure 4.15: Sign for " An intellectual person" in Persian Sign Language

In addition to the strong association between the word "bɒlɒ" and positive concepts in Persian tweets, the word "pɒjin" exhibited a strong association with negative concepts. Similar to Persian, in Persian Sign Language, downward movement is utilized to express negative concepts. In Figure 4.16, the signer is translating a tweet in which someone caused his colleague to be demoted. He uses both hands, starting from shoulder level, with his fingers as if holding someone. Then, the hands are pulled downward, symbolizing the action of someone being pulled down or moved to a lower position.

Figure 4.16: Sign for "Pulling someone down" in Persian Sign Language

Moreover, the word "pɒjin" was used to describe bad scores and grades. Downward movements express the same metaphor in Persian Sign Language. As shown in Figure

4.17, the signer begins by signing "grade" with the dominant hand. Then, he moves the hand downward, indicating that the grade is bad or has a lower value.

Figure 4.17: Sign for "Bad grades" in Persian Sign Language

The word "pɒjin" was also used to describe someone who lacks social or economic sophistication. This conceptual metaphor also exists in Persian Sign Language,

employing the downward movement. Figure 4.18 demonstrates the sign for a person with a low level of culture in Persian Sign Language. The signer begins by pointing to his head, symbolizing culture and intellect. Then, he moves his hand downward to indicate a lack of sophistication or intellectual refinement.

Figure 4.18: Sign for "Unsophisticated person" in Persian Sign Language

Finally, the Persian words 'bɒla' and 'pɒjin' frequently appeared together in the term "bɒla-o pɒjin" (up and down) to convey opposing qualities, such as good and bad, difficult and easy. This metaphor also exists in the Persian Sign Language. As demonstrated in Figure 4.19, the signer employs repetitive movements of his dominant hand, alternating between upward and downward gestures to express the fluctuating nature of life's ups and downs, good and bad times.

Figure 4.19: Sign for "Up and down" in Persian Sign Language

In summary, the results demonstrate that Persian Sign Language frequently employs upward and downward signs to express positive and negative concepts, similar to how the Persian language uses the words 'bɒlɒ' and 'pɒjin.' However, there are notable differences in their usage of the horizontal axis. While Persian metaphorically associates the words 'rɒst' and 'ʃæp' with positive and negative concepts, Persian Sign Language does not assign valence to the signs for the right and left sides. Instead, signers consistently use their dominant hand, irrespective of whether it is left or right, to produce the signs, and the direction of movement does not inherently determine the meanings. In fact, the movement direction may be mirrored depending on the signer's dominant hand. In essence, while the two languages share a mutual association between the vertical axis and valence, they diverge significantly in their patterns of the horizontal axis.

Chapter 5: Non-Linguistic Tasks

5-1 Introduction

The Body-specificity theory suggests that the connection between positive and negative concepts and the lateral sides of space is primarily influenced by an individual's handedness. According to this theory, individuals associate concepts of "goodness" with their body's dominant side, regardless of their linguistic or cultural backgrounds.

The primary objective of this study is to investigate the potential influence of linguistic patterns on the mappings between space and valence in human cognition. The study compares distinct groups of participants with similar handedness but whose languages exhibit different patterns of space-valence associations. Through non-linguistic tasks consisting of three computer-based tests, the study aims to examine how participants associate positive and negative valences with various directions in space. Additionally, the study seeks to determine whether right- or left-handed participants demonstrate similar or disparate performances in these tasks.

5-2 Method

Before starting the task, informed consent forms were obtained from all participants. The procedure was explained through written instructions, with verbal explanations for participants with hearing abilities and sign language instructions for those who were deaf. The examiner assured the participants that the task did not involve right or wrong answers but aimed to document their preferences. Additionally, participants were assured that all personal and identity information would be treated confidentially and anonymously.

Participants were instructed to sit directly in front of a rectangular touch-screen. The screen displayed two boxes positioned on its right and left sides for the Horizontal task, two boxes on the top and bottom for the Vertical task, and four boxes at each corner of the screen for the Four-sided task. Two emotional faces were presented in the center of the screen, with their order counterbalanced among participants. One of the faces conveyed a positive emotion, while the other showed a negative emotion. These emotional faces, known as emojis, are pictographs frequently used in written communication. The emojis used for the non-linguistic tasks were selected from the Unicode Standard character index, associated with happiness and sadness (Miller et al., 2016).

The participants first viewed a fixation cross for 1000 ms, followed by either a positive or negative emoji. The emoji remained on the screen until the participant responded, with a maximum duration of 5000 ms. Afterward, a blank white screen appeared for 100 milliseconds, followed by a second emoji, which also remained until a response was made, with a maximum response time of 5000 ms.

Their task was to categorize positive and negative emotional faces into the corresponding boxes based on their preferences. Following this task, participants completed the Edinburgh Handedness Inventory to determine their handedness. Additional information, such as age, gender, education, language and hearing capabilities, length of residency in another city (if applicable), participants' first language, and religion, was collected using a separate form after completing the task.

5-3 Non-linguistic Tasks

5-3-1 Horizontal Task

The initial non-linguistic task in this study is the Horizontal task . As Figure 5-1 illustrates, two boxes are positioned on the horizontal axis: one on the left and one on the right. Participants were instructed to assign one box for positive emotion and the other for negative emotion based on their personal preferences.

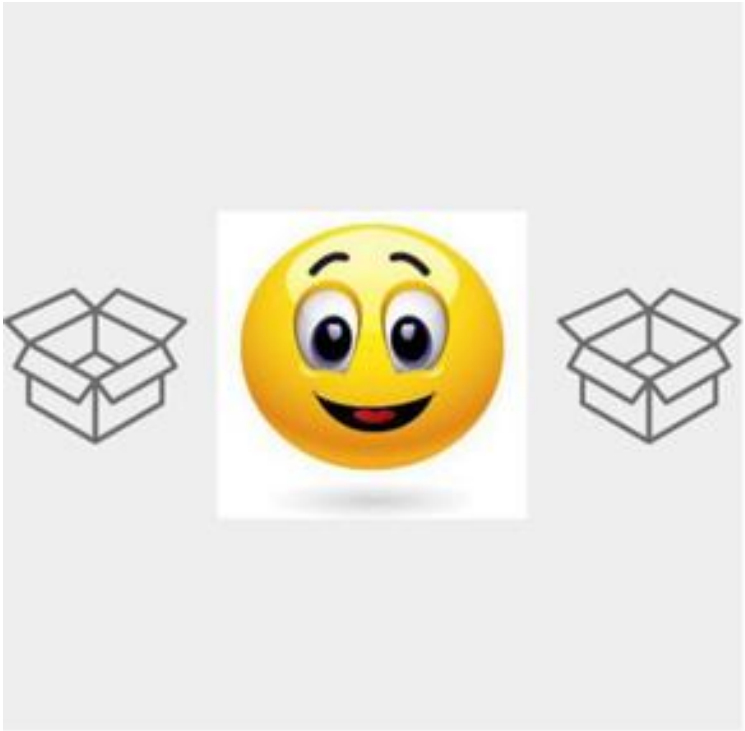


Figure 5-1: An illustrative representation of the Horizontal task displayed to participants

According to the body-specificity hypothesis, participants associate positive emotions with the side of space corresponding to their dominant hand. Therefore, the hypothesis predicts that right-handed participants will place positive emotions in the right box, while left-handed participants will likely choose the left box for positive emotions.

On the contrary, linguistic experiences have developed different patterns. In spoken

languages, linguistic conventions typically associate positive emotions with the right side, potentially reinforcing the bodily experiences of right-handed participants. However, this association may conflict with those of left-handed participants. Furthermore, Persian Sign Language does not exhibit a preference for associating positive emotions with either side of space. This absence of directional bias in Persian Sign Language contrasts with spoken Persian and English patterns, potentially leading to different results.

5-3-2 Vertical Task

The Horizontal task serves as a test case for the body-specificity hypothesis. However, one might argue that the observed variations in participants' results may not solely be due to differences in linguistic patterns. To address this issue, the Vertical task was introduced as a control test to examine scenarios in which all languages have a uniform association between space and valence.

The Vertical task replicated the procedure of the Horizontal task with a change in the box positions, moving them from the horizontal axis to the vertical axis, as illustrated in Figure 5.2. In this setup, all linguistic patterns from spoken and sign languages associate the concept of 'up' with positive emotion and 'down' with negative emotion. This consistent linguistic pattern across languages acts as a control variable in the study.

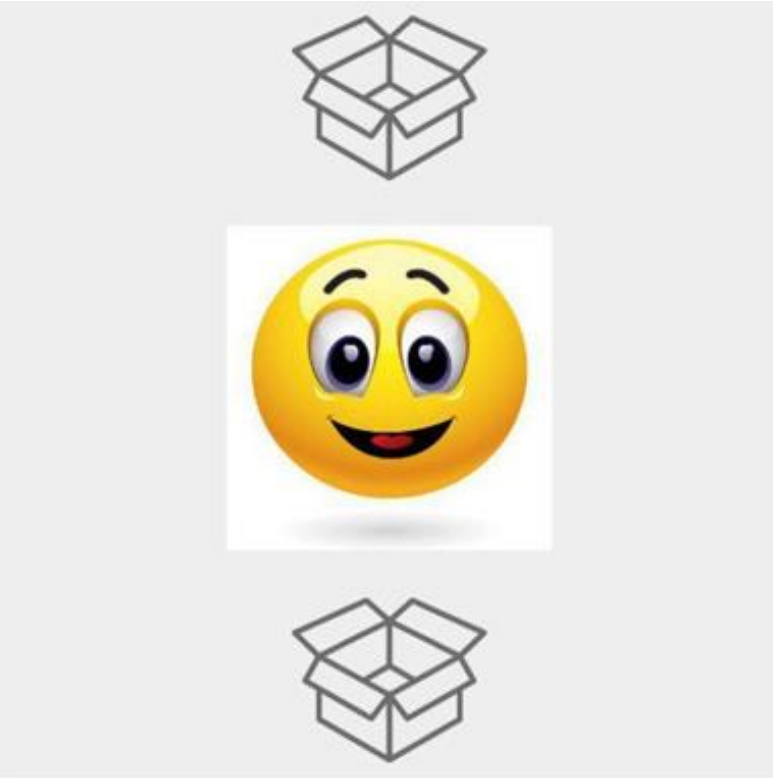


Figure 5-2: An illustrative representation of the Vertical task displayed to participants

5-3-3 Four-Sided Task

The Four-sided task integrates both the horizontal and vertical axes, creating a scenario where the spatial metaphors common between languages and those that differ between languages are simultaneously present in one task.

In this task, four boxes are positioned at the four corners of the screen: upper right, upper left, lower right, and lower left. Participants are instructed to assign positive and negative emotions to different boxes according to their preferences. The Four-sided task aims to validate the consistency of findings from the Horizontal and Vertical tasks.

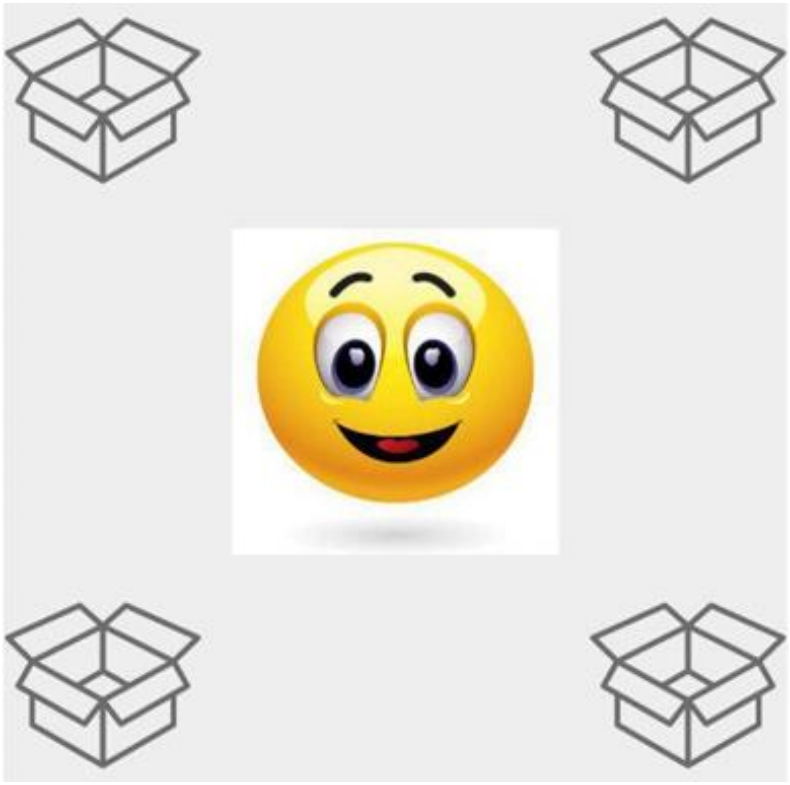


Figure 5-3: An illustrative representation of the Four-sided task displayed to participants

5-4 Participants

This study includes three distinct groups of participants: Persian speakers, English speakers, and Persian Sign Language users. In total, 1004 individuals participated in the study. However, data from 65 individuals were excluded because they did not meet the inclusion criteria. Consequently, the final dataset comprises data from 1032 participants who completed three tasks: horizontal, vertical, and four-sided.

5-4-1 Persian-Speaking Participants

The first group consisted of native Persian speakers. These participants had not resided continuously in another city for more than three months. All had completed at least their compulsory education and had no physical disabilities that affected task performance. Data from 572 participants were gathered. However, 25 participants were excluded for not meeting the conditions: nine individuals for ambidextrous hand preference, two for having lived in another city for an extended period, 12 for bilingualism, and two due to issues encountered during task performance. Ultimately, data from 547 participants were analyzed, which included 492 right-handed (221 females; mean age M=27.18 years; standard deviation SD=8.85 years) and 55 left-handed participants (23 females; mean age M=27.32 years; SD=7.92 years).

5-4-2 English-Speaking Participants

The English participants in this study were native speakers and met conditions similar to those of the Persian participants. They had not continuously lived in another city for more than three months, had completed their educational requirements, were not ambidextrous, and had no physical limitations that affected task performance.

Out of the 249 English-speaking individuals who participated, data from 13 were excluded for the following reasons: five were bilingual, one had a physical limitation affecting hand movement, two had lived in another city for an extended period, and five were ambidextrous. The final dataset comprises 236 participants, which include 210 right-handed participants (112 females; mean age M= 28.6 years; standard deviation SD= 13.09 years) and 26 left-handed participants (10 females; mean age M= 29.18 years; SD= 18.59 years).

5-4-3 Persian Sign Language Users

A total of 276 deaf individuals participated in this study. However, data from 27 participants were excluded from the analysis for various reasons: 13 participants had medical conditions or asymmetrical hearing loss, two participants were ambidextrous, six participants faced difficulties in performing the tasks, and six participants had not completed compulsory education. As a result, data from 249 participants were analyzed. This dataset included 223 right-handed individuals (92 females; mean age M= 39.48 years; SD= 13.54 years) and 26 left-handed individuals (11 females; mean age M= 35.52 years; SD= 9.98 years).

5-5 Results

In this study, participants from three distinct linguistic backgrounds, including both right-handed and left-handed individuals, engaged in three non-linguistic tasks. This chapter offers a detailed analysis of the data collected.

Firstly, the results of the three non-linguistic tasks for each linguistic group are presented to examine the predictions made by the body specificity hypothesis. Right- and left-handed participants within each language group are compared to see if their mental mappings are similar or differ significantly.

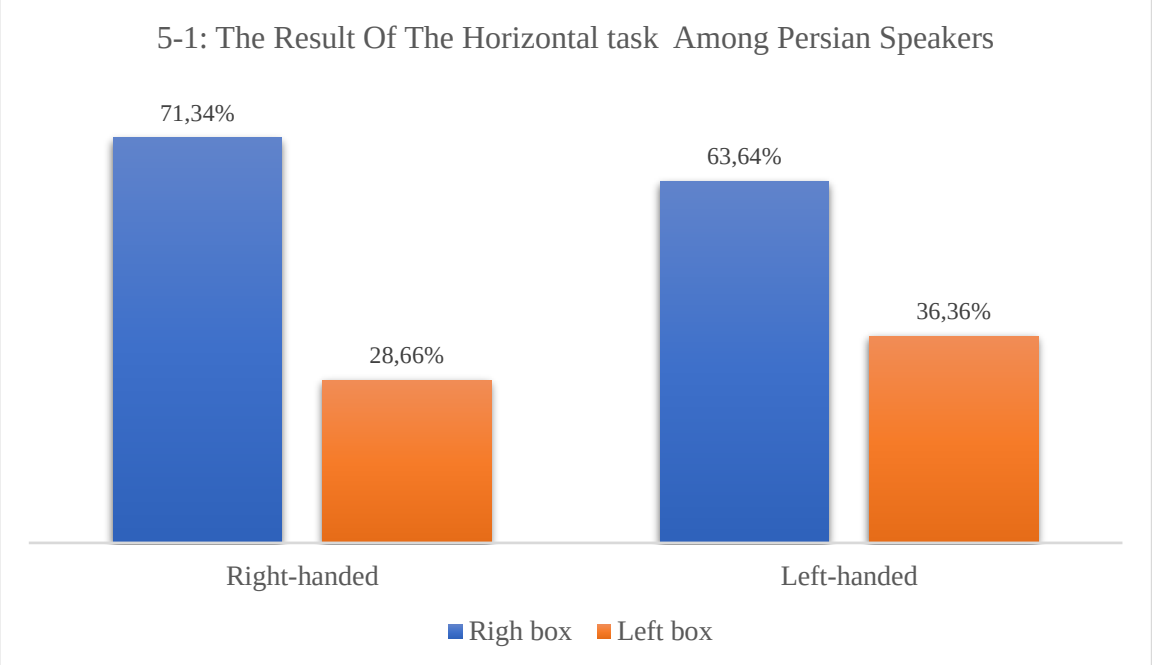
Secondly, a cross-linguistic analysis will be conducted to determine whether language and/or handedness influence the association between space and valence in the mind.

5-5-1 Results Of Persian Speakers

5-5-1-1 Results Of The Horizontal Task In Persian Speakers

Figure 5-1 illustrates the findings from the Horizontal task, revealing that 71.34% of right-handed Persian participants positioned positive emotions in the right box, whereas 28.66% selected the left box.

Binomial tests were conducted to determine if there was a significant deviation from the expected 50% (random choice) regarding placing positive emotions in the right box for the Horizontal task. The binomial test results indicate that right-handed Persian participants exhibit a significant preference for placing positive emotions in the right box (p-values < 0.001).



Also, the result shows that, like the right-handers, most left-handed Persian

participants preferred the right box for positive emotions (63.64%), while 36.36% selected the left box. The binomial test resulted in a P-value of 0.058 for left-handers.

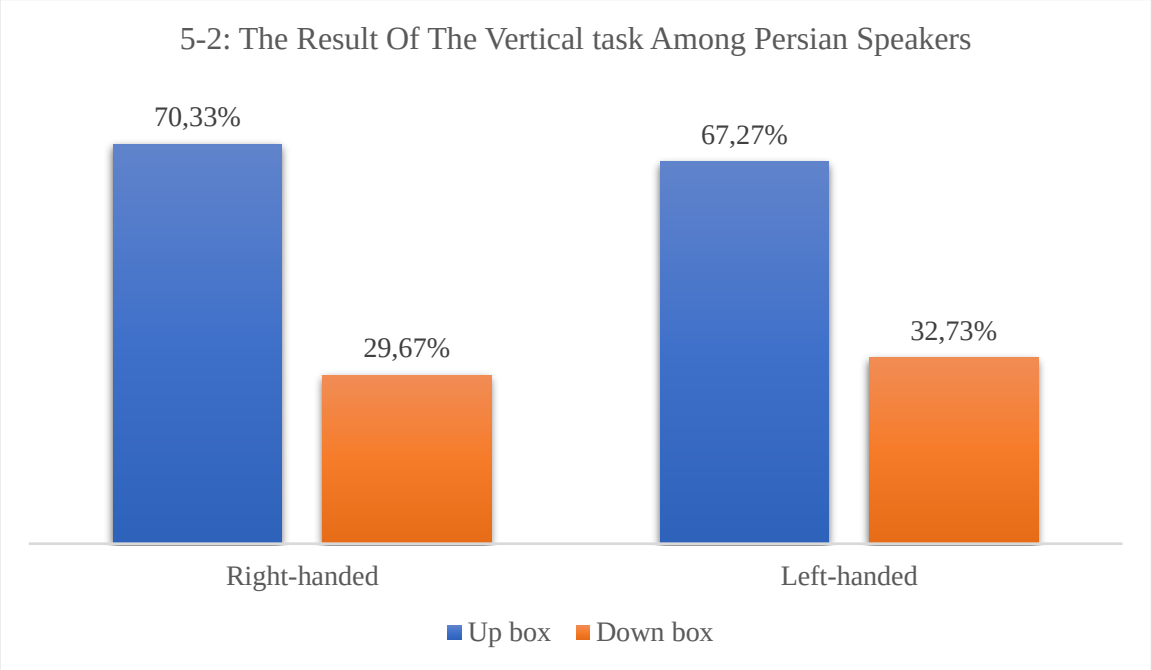
This data indicates that right-handed Persian participants were more inclined to associate positive emotion with the right box than left-handers (the Odds Ratio is 1.422). However, Fisher's exact test revealed no significant differences between right-handed and left-handed Persian participants (p-value = 0.274).

5-5-1-2 Results Of The Vertical Task In Persian Speakers

Figure 5-2 presents the results of the Vertical task for Persian speakers. The data reveals that 70.33% of right-handed and 67.22% of left-handed Persian participants placed positive emotion in the 'up' box.

Binomial tests resulted in a P-value of <0.001 for right-handers and a P-value =0.014 for left-handers.

Fisher's exact test indicates no significant difference between right- and left-handed participants (P-value: 0.644).



5-5-1-3 Results Of The Four-Sided Task In Persian Speakers

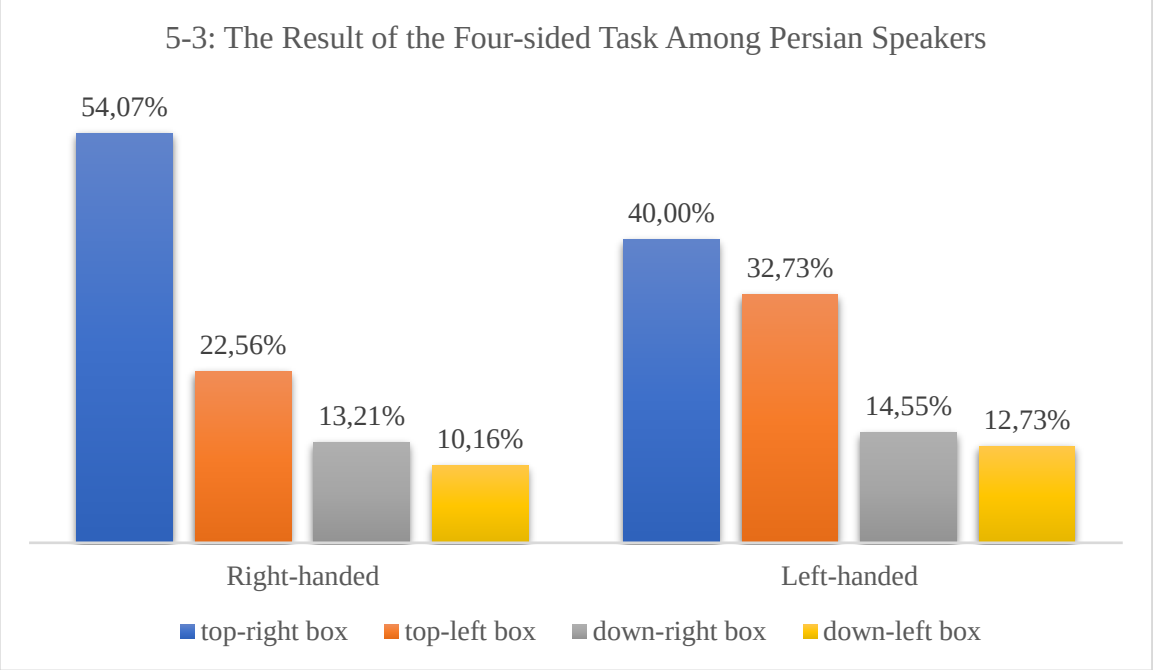
Figure 5-3 shows how Persian right-handed and left-handed participants placed the positive emotion in four boxes of Four-sided task. As illustrated, the majority of both right- and left-handed participants placed positive emotions in the top-right box. Furthermore, the bottom-left box was the least selected place for placing the positive emotion by both groups.

Moreover, results show that 76.63% of right-handed and 72.73% of left-handed participants put positive emotion on top boxes.

The binomial test resulted in the P-value<0.001 for both right and left-handers. This result confirms the outcome of the Vertical task.

Also, the majority of both groups, 67.28% of right-handed and 54.55% of left-handed participants, selected the right boxes for positive emotion, which also aligns with the Horizontal task results. The binomial test resulted in a p-value=

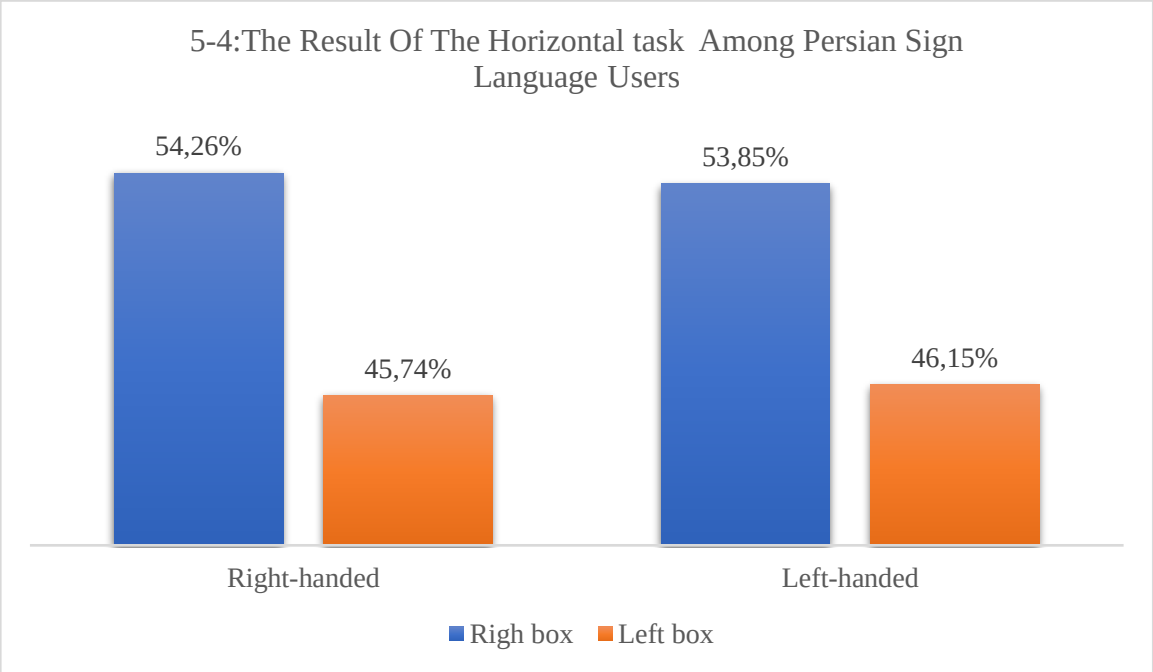
0.001 for right-handers and a p-value= 0.590 for left-handers. Therefore, the outcome of the Four-sided task is compatible with the result of the Horizontal task.



5-5-2 Results Of Persian Sign Language Users

5-5-2-1 Results Of The Horizontal Task In Persian Sign Language Users

Figure 5-4 displays the results of the Horizontal task among Persian Sign Language users. This Figure shows that 54.26% of right-handed Persian Sign Language users placed the positive emoji in the right box, while 45.74% chose the left side. For left-handed sign language users, 53.85% preferred the right box for the positive emoji, and 46.15% selected the left box.



Binomial tests were performed separately for right-handed and left-handed Persian Sign Language users to determine if there were significant differences in the placement of positive emotion between the right and left boxes. The binomial test resulted in a p-value of 0.228 for right-handed Sign Language users and a p-value of 0.845 for left-handed users. These results suggest no significant difference in the preference for placing the positive emoji in the right box over the left box among right-handed and left-handed participants.

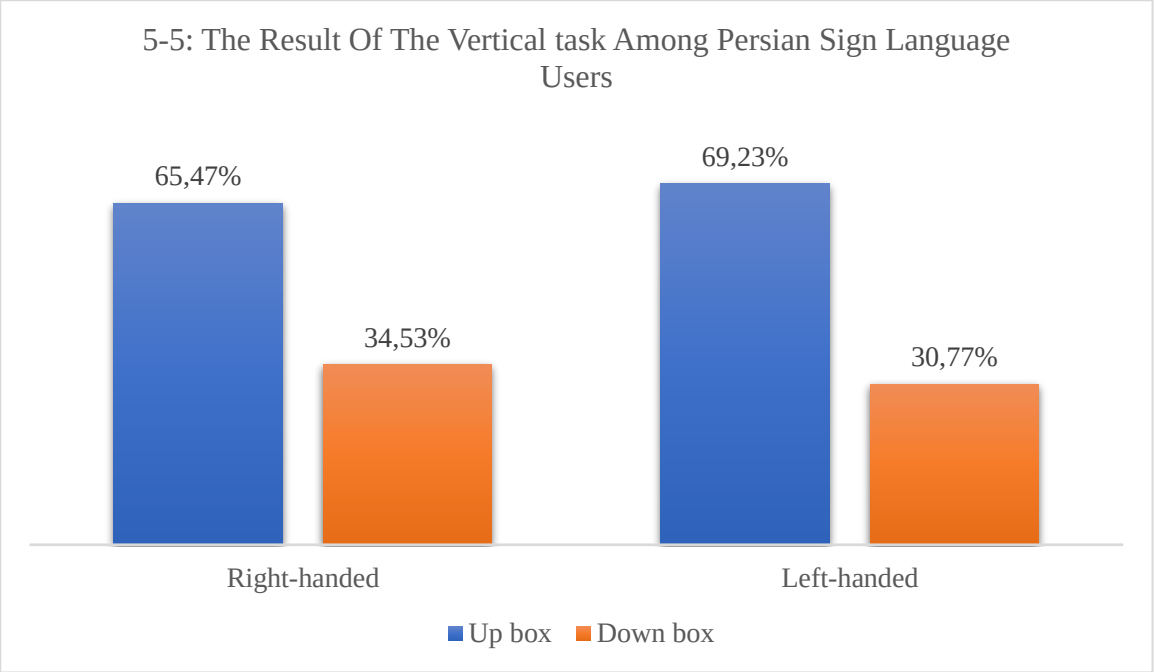
Furthermore, Fisher's exact test was conducted to explore any significant differences between the behaviors of right and left-handed Persian Sign Language users. The resulting P-value=1 suggests that there is no statistically significant association between handedness and the placement of positive emotion in either the right or left boxes. This indicates that right and left-handed Persian Sign Language participants exhibit similar behaviors in the Horizontal task.

5-5-2-2 Results Of The Vertical Task In Persian Sign Language Users

Figure 5-5 displays the outcomes of the Vertical task among Persian sign language users. The data reveals that 65.47% of right-handed and 69.23% of left-handed participants placed positive emotion in the 'up' box.

The binomial test resulted in a P-value<0.001 for right-handers and a P-value=0.076 for left-handers.

The result of Fisher's exact test shows that there is no significant difference between right and left-handed participants in this task (P-value=0.828).

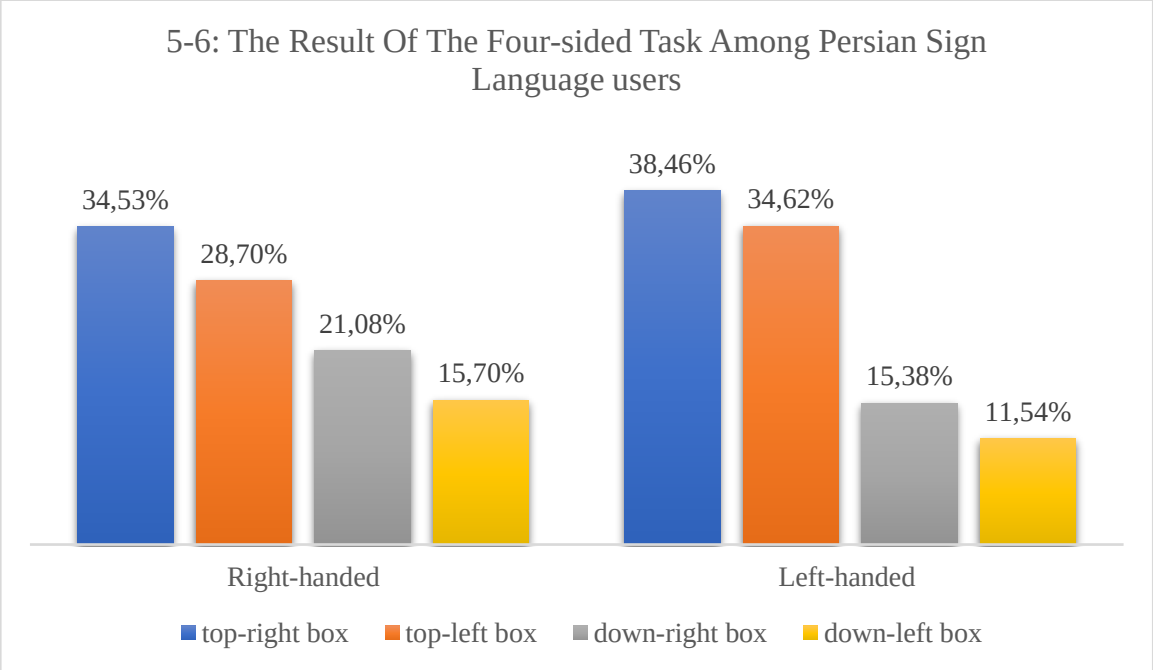


5-5-2-3 Results Of The Four-Sided Task In Persian Sign Language Users

Figure 5-6 displays the outcomes of the Four-sided task among sign language users. It reveals that 73.08% of left-handed participants and 63.23% of right-handed

participants chose the upper boxes for positive emotions. This preference aligns with the findings from the Vertical task for these groups. The binomial test yielded a P-value<0.001 for right-handed participants and a P-value=0.029 for left-handed participants, indicating significant preferences in both groups.

Additionally, the data show that 55.61% of right-handed and 53.85% of left-handed participants placed positive emotions in the right boxes. The binomial test for this distribution resulted in a P-value=0.108 for right-handed participants and a P-value=0.845 for left-handed participants, meaning both groups did not show a significant preference for right or left sides of space. These results further corroborate the findings from the Horizontal task among these participants.



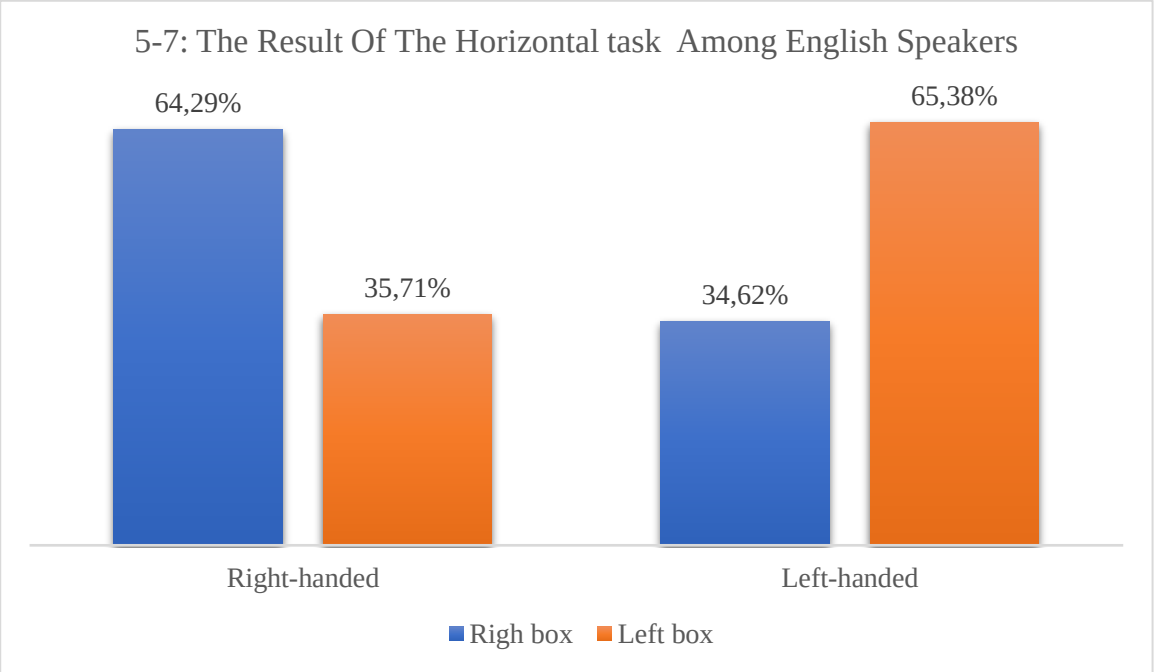
Furthermore, when comparing the left and right boxes on top and bottom separately, no significant differences could still be detected either in the left- or right-handed participants. Among left-handed participants, 57.14% selected the down-right vs down-left (p-value = 1), and 52.63% selected the top-right vs. top-left (p-value =1).

Similarly, 57.32% of right-handed participants selected down-right vs. down-left (p-value = 0.224), and 54.61% selected top-right vs. top-left (p-value = 0.312). This result further confirms the findings from the Horizontal task, indicating that Persian Sign Language users, whether right or left-handed, do not show a preference for one side of lateral space over the other when associating spaces with valence.

5-5-3 Results Of English Speakers

5-5-3-1 Results Of The Horizontal Task In English Speakers

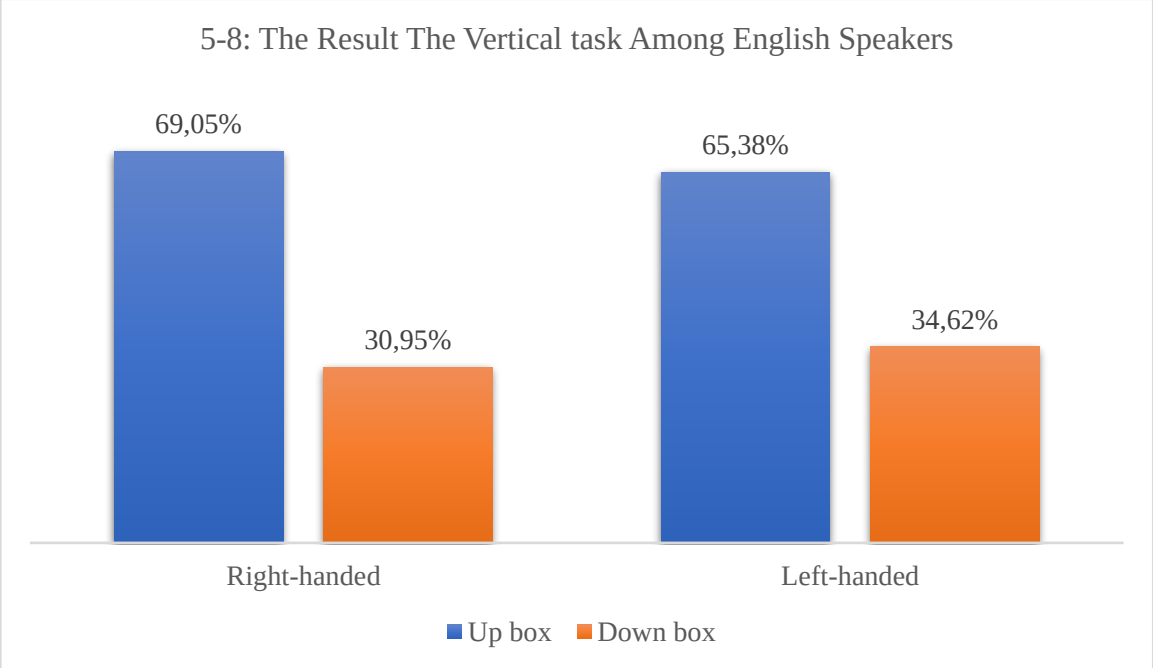
Figure 5-7 illustrates the outcomes of the Horizontal task among English speakers. The results revealed that most right-handed participants (64.29%) placed the positive emoji in the right box, whereas 35.71% selected the left box. Conversely, the majority of left-handed participants (65.38%) selected the left box for the positive emoji, while 34.62% selected the right box. Binomial tests yielded a P-value of <0.001 for right-handers and a P-value of=0.169 for left-handed participants.



The odds ratio for comparing right and left-handed participants was calculated to be 3.38, with a p-value of 0.005. This finding indicates that right-handed participants are 3.38 times more likely than left-handed participants to place positive emotions on the right side.

5-5-3-2 Results Of The Vertical Task In English Speakers

Figure 5-8 shows the result of the Vertical task among English participants. The results show that 69.05% of right-handers and 65.38% of left-handers placed the positive emotion in the 'up' box. The binomial test resulted in a P-value of <0.0001 for right-handers and a P-alue=0.169 for left-handers.

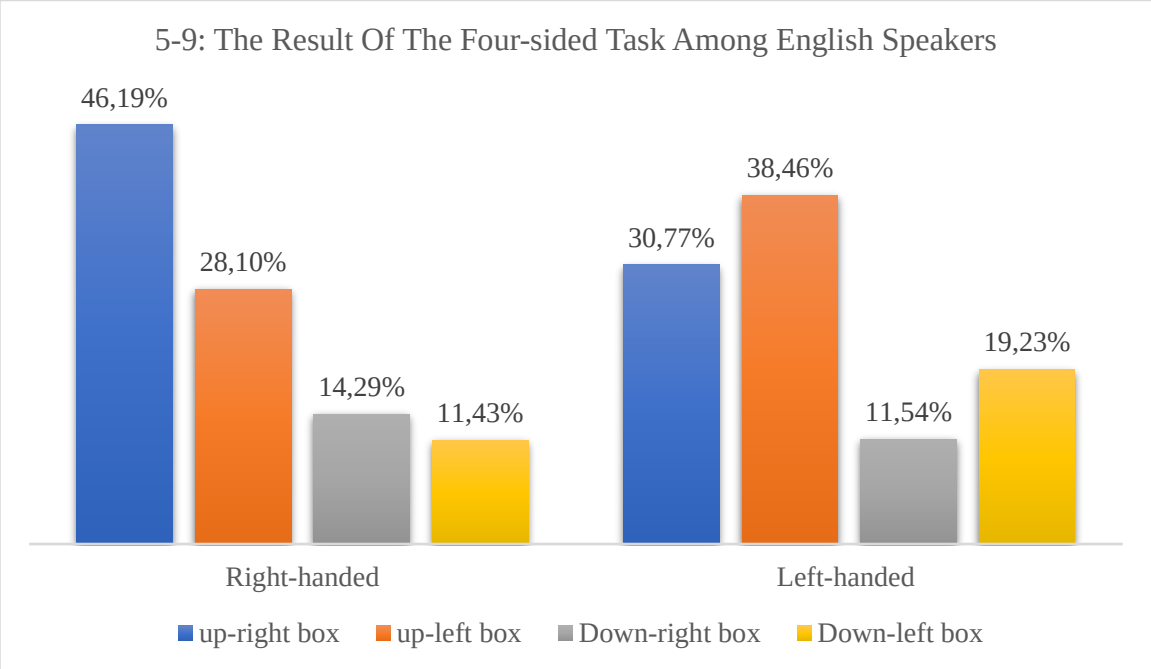


Furthermore, Fisher's exact test yielded a p-value of 0.823, indicating that there are no significant differences between right and left-handed participants in their inclination to

place positive emotions in the 'up' box.

5-5-3-3 Results Of The Four-Sided Task In English Speakers

Figure 5-9 displays the results of the Four-sided task among English participants. The result shows that 74,29% of right-handers and 69.23% of left-handers selected the upper boxes to place positive emotions. The binomial tests resulted in a P-value<0.001 for right-handers and a P-value=0.076 for left-handers. This finding supports the result of the Vertical task among these participants.



Moreover, most right-handed participants (60,48%) put positive emotion in the right boxes. The binomial task resulted in P-value=0.003. Conversely, most left-handed participants (57.69%) selected the left boxes. The binomial test resulted in a P-value of 0.557. This result aligns with the findings from the Horizontal task among these

participants.

5-5-4 Comparing Participants Across Three Languages

This study applied a binary logistic regression model. This type of model is particularly useful for understanding how different factors influence a specific outcome that can only be one of two options. In this chapter, a logistic regression model investigates the effects of language (Persian, English, and Persian Sign Language) and handedness (left-handed vs. right-handed) on the selection of boxes on the left or right side of a horizontal axis. The goal is to understand how language and handedness which previously studied separately in this dissertation and literature, contribute to shaping the association between space and valence in mind.

To evaluate the impact of language and handedness on the outcomes, a chi-square-based ANOVA (analysis of variance) was employed. This statistical approach compares a model incorporating both language and handedness against a baseline model devoid of these variables. Their respective p-values determine the significance of each factor's contribution to model improvement. Table 5.1 shows the findings of this analysis. The term "residual deviance" in this table refers to the model's error margin. The "Null model" denotes a baseline model excluding language and handedness variables. As depicted in Table 5.1, integrating the language into the model significantly reduced deviance (p-value < 0.0001). This result indicates that language significantly impacts the participants' choices. Further, integrating the handedness into the model also significantly reduced deviance (p-value = 0.022). Thus, both language and handedness significantly influence the selected box.

Table 5-1: Chi-square-based ANOVA results on the binary logistic regression model for the Horizontal task. DF shows degrees of freedom.

	DF	Deviance	Residual DF	Residual deviance	P-value (Chi-square)
NULL model			1031,000	1343,368	
Language	2,000	21,392	1029,000	1321,976	<0,0001
Handedness	1,000	5,230	1028,000	1316,746	0,022

In summary, the results from the logistic regression model revealed that the association between space and valence in participants' minds is not merely body-specific or linguistic-specific. Indeed, both language and handedness play significant roles in shaping this association.

For a control analysis, the previous procedure was replicated for the Vertical task. The outcomes of this analysis are presented in Table 5-2.

Table 5-2: Chi-square-based ANOVA results on the binary logistic regression model for the Vertical task. DF shows degrees of freedom.

	DF	Deviance	Residual DF	Residual deviance	P-value (Chi-square)
NULL model			1031,000	1282,710	
Language	2,000	1,363	1029,000	1281,346	0,506
Handedness	1,000	0,106	1028,000	1281,241	0,745

As illustrated in Table 5-2, neither language (p-value = 0.506) nor handedness (p-value = 0.745) significantly enhances model performance relative to the Null model. This result indicates that in the Vertical task, neither language nor handedness affected the selection of boxes by participants. In other words, regardless of their language and handedness, all participants have similar behavior to attribute the positive valence to up and negative

valence to down sides of space. These results and findings will be further elaborated upon and discussed in the conclusion chapter.

Chapter 6: The Linguistic Task

6-1 Introduction

As discussed in Chapter Five, the results of the nonlinguistic tasks emphasized the importance of linguistic patterns in shaping the association between lateral space and valence in the human mind. This chapter delves deeper into the role of language patterns, particularly focusing on how the words "rɒst" (right) and "ʧæp" (left) are conceptualized in the minds of right- and left-handed Persian speakers. Therefore, the new metaphor task, as a linguistic task, is created for this study to examine the valence of the words "rɒst" (right) and "ʧæp" (left) in the minds of Persian speakers and compare them between right and left-handed participants.

There is a pattern in the Persian language where the combination of valenced words like 'xoʃ' (good) and 'bæd' (bad) with various verbs and nouns creates compound words with strong positive or negative valence. In the linguistic task, the spatial words 'rɒst' (right) and 'ʧæp' (left) from these established metaphors are substituted with the spatial words 'rɒst' (right) and 'ʧæp' (left), forming novel compounds not previously found in the language. Both right-handed and left-handed participants were then asked to assess the valence of these new words. The main question is whether the spatial words 'rɒst' (right) and 'ʧæp' (left) carry any intrinsic valence in speakers' minds and, if so, to determine whether this perceived valence differs between right-handed and left-handed individuals.

6-2 Method

The linguistic task comprised 20 new compound words, each containing a spatial word as one of its components. These new words were categorized into two groups: 'nonsense words' and 'analogical words'. Nonsense words were formed by combining a spatial word with one or two non-meaningful syllables. Analogical words were generated using an analogy method based on common and established Persian compounds. Their structural composition will be elaborated upon to understand analogical words better.

The six pairs of words presented below are existing Persian compounds, each comprising two components: a valence word ('xoʃ', meaning 'good', or 'bæd', meaning 'bad') and a common verb or noun in Persian. These combinations resulted in linguistically coherent words that inherently carry a pronounced positive or negative connotation in Persian.

1-xoʃ-bin/bæd-bin

xoʃ-bin	bæd-bin
good-see	bad-see
“Optimistic”	“Pessimistic”

2-xoʃ-hɒl/bæd-hɒl

xoʃ-hɒl	bæd-hɒl
good-state	bad-state
“Happy”	“Unwell”

3-xoʃ-sɒxt/bæd- sɒxt

xoʃ-sɒxt	bæd- sɒxt
good-made	bad-made

“Well-made”	“Badly made”

4-xoʃ-del/bæd-del

xoʃ-del	bæd-del
good-heart	bad-heart
“Good-hearted, Kind”	“Suspicious, Malicious”

5-xejr-xɒh/bæd-xɒh

xejr-xɒh	bæd- xɒh
good-want	bad-want
“Benevolent”	“Malevolent”

6-xoʃ-ɢædæm/bæd- ɢædæm

xoʃ-ɢædæm	bæd- ɢædæm
good-step	bad-step
“Lucky”	“Jinx”

The linguistic task utilized these established Persian compounds and replaced the valence words 'xoʃ' (good) and 'bæd' (bad) with the spatial words 'rɒst' (right) and 'ʧæp' (left). This substitution led to the creation of twelve entirely new compounds, none of which are currently existing words in Persian. Participants were then presented with these novel words and asked to evaluate the valence of each word. The linguistic task was performed using two A4 sheets. The first page dedicated to the instruction of tests follows:

Some idioms and phrases in languages convey meanings beyond their literal interpretations. For example, in Persian, the expression "sær-bolænd[4]" does not refer to a long head but describes someone proud and honorable, carrying a very positive meaning. Conversely, the term "ʧeʃm-sefid[5]" describes a shameless person, implying a negative meaning.

On the next page, you will find some terms from various languages that have been translated into Persian. Please read them in the order provided. If you feel a word carries a positive meaning, place a "+" in front of it. If you feel it has a negative meaning, place a "−" in front of it. Remember, this questionnaire has no 'right' or 'wrong' answers and is intended purely for academic research. We greatly appreciate your cooperation.

The second page displayed a vertical list of the newly formed words. Each participant was presented with a list of ten words, beginning with four nonsense words followed by six analogical words. The distribution of 'rɒst' and 'ʧæp' was counterbalanced among participants.

Following the linguistic task, participants were requested to complete a shortened version of the Edinburgh Handedness Inventory to determine their dominant hand.

6-3 Participants

A total of 163 individuals, consisting of 78 females (age M = 23.2, SD = 4.3) and 85 males (age M = 24.7, SD = 4.6), participated in the linguistic task. All were native Persian

[4] (*head-long), meaning: honorable*
[5] (eye-white) meaning: shameless

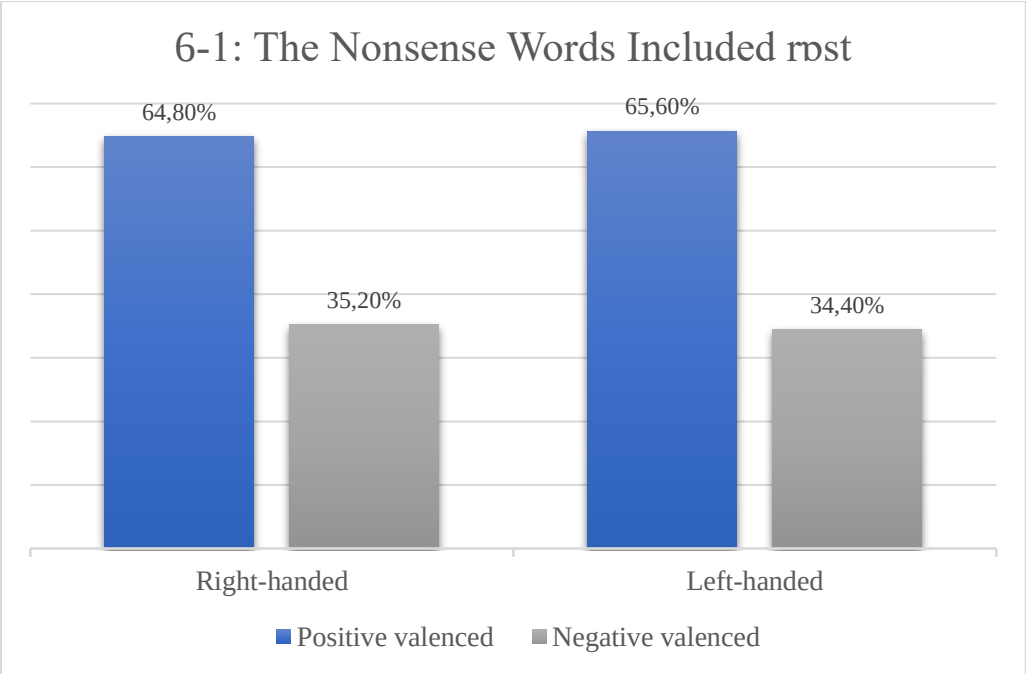
speakers and residents of Tehran. Of these participants, 118 were right-handed, and 45 were left-handed.

6-4 Results

The purpose of the linguistic task is to examine the valence associated with the directional words "rɒst" (right) and "ʧæp" (left) among Persian speakers. Additionally, it aims to investigate potential differences in how right-handed and left-handed participants attribute valence to these directional words. The subsequent section will present the results of the linguistic task, categorized into nonsense and analogical words.

6-4-1 Nonsense Words

Nonsense words are combinations of directional words with one or two meaningless syllables. Chart 6-1 illustrates how right-handed and left-handed participants evaluated the valence of nonsense words, including the word "rɒst".



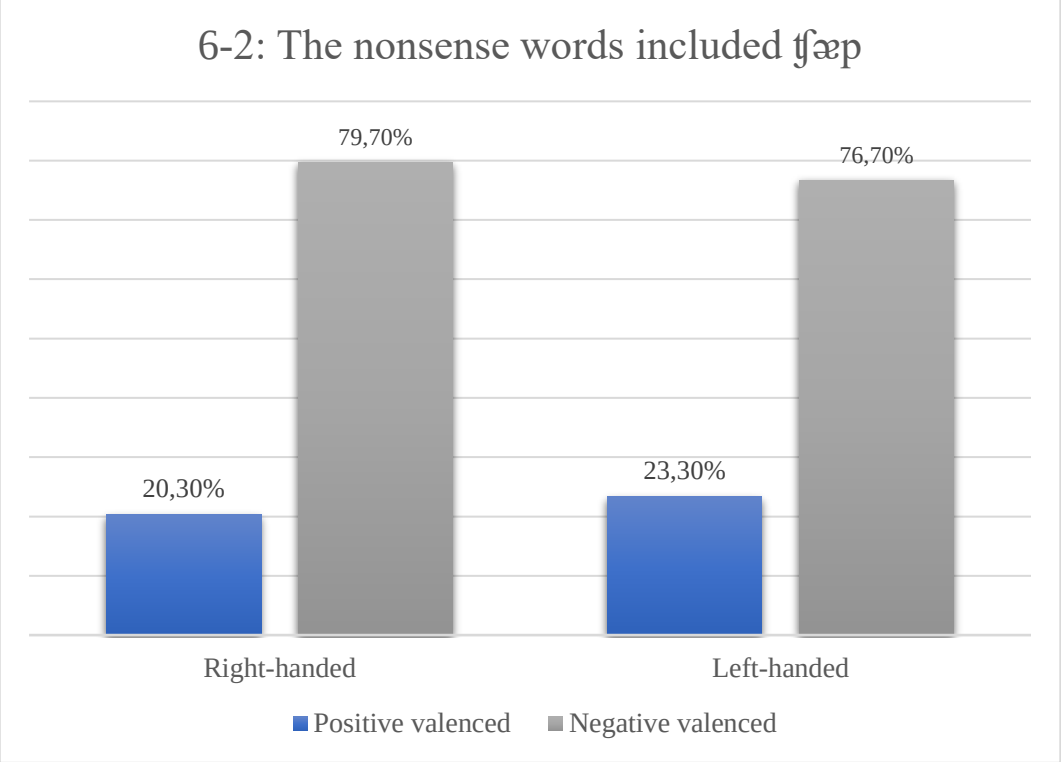
The findings indicate that 64.8% of right-handed participants perceived nonsense words containing "rɒst" as having positive connotations, while 35.2% assessed them negatively. A binomial test yielded a p-value < 0.001, indicating a significant tendency among right-handed participants to assign positive meanings to the nonsense words containing the word "right".

On the other hand, 65.6% of left-handed participants assigned a positive meaning to the nonsense words containing "rɒst," while 34.4% of them assigned a negative meaning to these words. The binomial test resulted in a p-value of 0.004, meaning left-handed participants, similar to right-handed participants, evaluated the nonsense words built by the word "rɒst" as positively valued.

Fisher's exact test was conducted to explore whether there was any significant statistical difference between the evaluations of words by right- and left-handers. The analysis revealed that 64.8% of right-handed participants and 65.6% of left-handed participants

marked the nonsense words containing the word "rɒst" as positive. The resulting p-value from Fisher's exact test was 1, indicating that there was no significant difference between right- and left-handed participants in their evaluations.

Chart 6-2 illustrates how right-handed and left-handed participants perceived the valence of nonsense words containing the word "ʧæp".



As shown in Chart 6-2, 79.7% of right-handed participants associated negative valence with the nonsense words containing "ʧæp", while 20.3% attributed positive valence to these words. The binomial test yielded a p-value < 0.001, indicating that right-handed participants significantly perceived the nonsense words with "ʧæp" as negatively valenced.

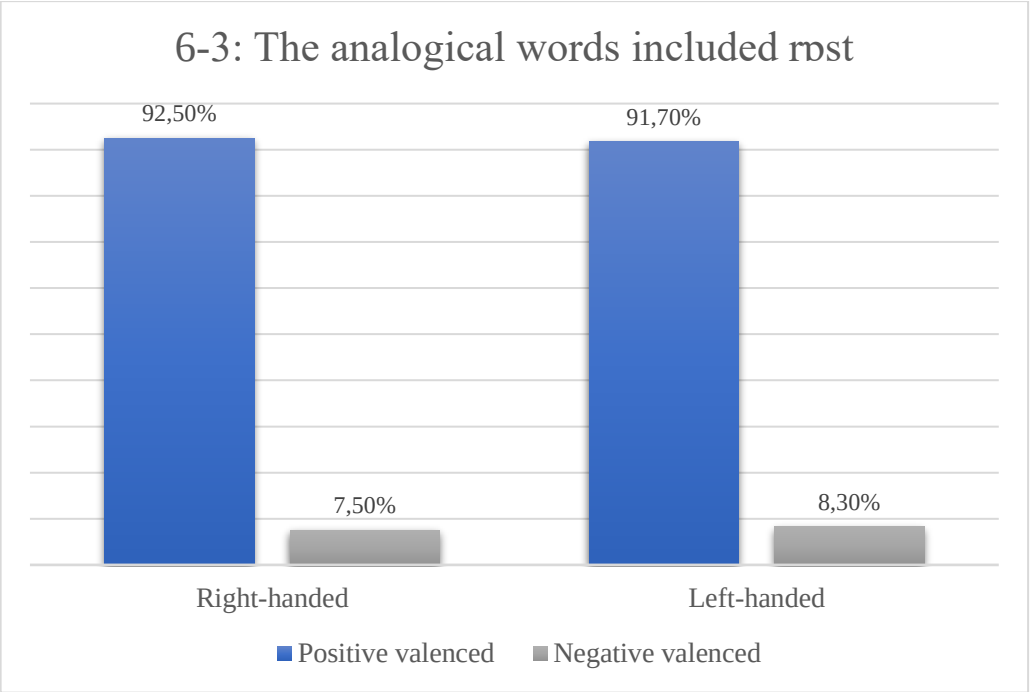
Similarly, 76.7% of left-handed participants assigned a negative valence to the words containing "ʧæp," while 23.3% evaluated them positively. The binomial test for left-handed participants also resulted in a p-value < 0.001, indicating that left-handed participants, similar to the right-handers, significantly assigned negative meanings to the nonsense words containing the word "ʧæp".

Fisher's exact test was conducted to determine whether there were statistically significant differences between right- and left-handed participants. The test yielded a p-value of 0.547, indicating no significant difference between right- and left-handed participants in perceiving the valence of nonsense words containing the word "ʧæp" as negative.

In summary, both right- and left-handed participants significantly evaluated the nonsense words containing 'rɒst' as having positive connotations, while nonsense words containing 'ʧæp' were generally perceived as having negative connotations.

6-4-2 Analogical Words

Analogical words are formed by replacing one component of previously existing compounds in Persian with a directional word, resulting in a new word in the language. Chart 6-3 illustrates how right-handed and left-handed participants evaluated the valence of analogical words containing the directional word "rɒst".



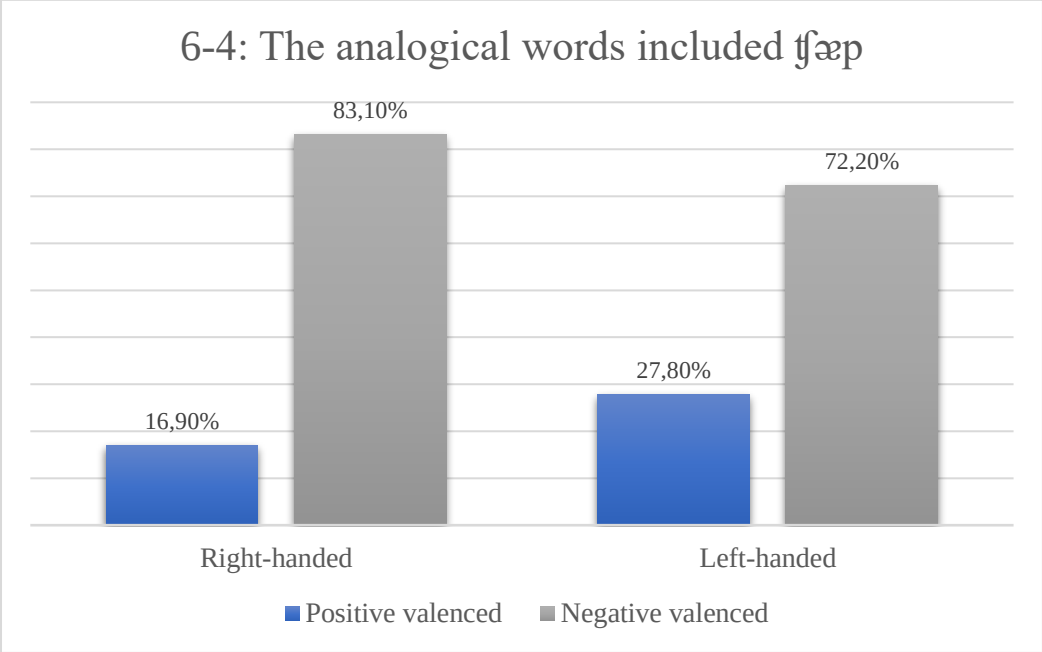
The results show that 92.5% of right-handed participants attributed a positive valence to analogical words containing the word "rɒst," while 7.5% assigned a negative valence to these words. A binomial test comparing right-handed participants who evaluated the words positively versus negatively yielded a p-value of <0.001, indicating a significant preference among right-handers to perceive analogical words with "rɒst" as positive.

Similarly, 91.7% of left-handed participants associated a positive valence with analogical words containing "rɒst," with 8.3% assigning a negative valence to these words. The binomial test for left-handed participants also resulted in a p-value of <0.001, suggesting that most left-handers significantly perceived analogical words containing "rɒst" as having a positive connotation.

Fisher's exact test was utilized to compare the evaluations of right- and left-handed participants regarding the valence of analogical words containing "rɒst." Results revealed

a p-value of 1, suggesting no significant difference between the two groups. This finding suggests that both right- and left-handed participants attribute positive meanings to the analogical words containing "rɒst."

Chart 6-4 illustrates how right-handed and left-handed participants evaluated the valence of analogical words containing "ʧæp."



The findings showed that 83.1% of right-handed participants perceived the analogical words containing "ʧæp" as having a negative valence, whereas 18.4% evaluated them positively. A binomial test comparing right-handed participants who assessed the words negatively versus positively yielded a p-value of <0.001, indicating a significant

inclination among right-handed participants to perceive the analogical words containing "ʃæp" as negative.

Similarly, 72.2% of left-handed participants associated a negative meaning with the analogical words containing "ʃæp", while 27.8% attributed a positive valence to them. The binomial test for left-handed participants also resulted in a p-value of <0.001, indicating a significant inclination among left-handed participants to perceive the analogical words with "ʃæp" negatively.

A Fisher's exact test was conducted to compare right- and left-handed participants. The result yielded a p-value of 1, indicating no significant difference between the two groups. This suggests that both right- and left-handed participants showed a similar pattern in evaluating the analogical words containing "ʃæp" as negative.

In summary, the linguistic task revealed a consistent pattern among both right and left-handed Persian participants. Regardless of handedness, both groups consistently perceived the newly introduced words, including nonsense and analogical compounds, as positive when the word included the directional word "rɒst". Conversely, participants perceived these compounds as negative when formed using the directional word "ʃæp". These findings suggest that words for the right and left sides of space carry an intrinsic valence in speakers' minds, independent of participants' bodily experiences, such as handedness.

Chapter 7: Discussion

Embodiment theory posits that our cognition is fundamentally grounded in our physical experiences. According to Lakoff and Johnson (1980), a conceptual metaphor is a cognitive mapping that allows us to understand one abstract concept like valence in terms of a more familiar and concrete concept like space. Expressions such as 'right-hand man or 'the right path' are prominent examples of these metaphors in everyday language. It is well-documented across many different languages and cultures that positive concepts are related to the right side and negative concepts to the left side of space.

In 2009, Daniel Casasanto introduced the body specificity hypothesis, which suggests that the association between the lateral space and valence reflects a universal embodied experience. According to this hypothesis, individuals interact more easily with their environment using their dominant hand. Therefore, they tend to associate the dominant side of their body with positive concepts. For right-handed individuals, 'right' is associated with good, and 'left' with bad. Conversely, left-handed individuals associate 'left' with good and 'right' with bad. This association between the dominant side of the body and positive concepts contradicts the widespread metaphors across various languages and cultures that suggest 'right is good' and 'left is bad'. Consequently, the body specificity hypothesis rejects the effects of linguistic and cultural patterns and declares that lateral space-valence association in the mind is only body-specific. This study is a comparative study that aims to test the body specificity hypothesis and investigate the role of language in shaping spatial metaphors in the mind.

The association between lateral space and positive/negative valence is a well-studied pattern among languages. However, there is remarkable diversity among languages. In

Persian, the metaphorical associations of lateral space with valence are far more robust than in other languages studied thus far. On the other hand, Persian sign language completely lacks the lateral space-valence association. This study suggests that a comparison between Persian, with pronounced space-valence associations, and Persian Sign language, where this association is absent, would reveal whether linguistic patterns play any role in conceptualizing valence through space in the mind.

This study began with an examination of dictionaries and the Persian Linguistic Database (PLDB) to explore the metaphorical meanings and connotations of the words 'rɒst' and 'ʧæp' in Persian. The findings showed that the word 'rɒst' expresses many positive concepts, such as truth, correctness, and honesty in Persian. Conversely, the word 'ʧæp' expresses several negative concepts, including enmity, lies, and harassment.

Then, the study focused on comparing the metaphorical meanings of the spatial words between Persian and English. Chapter three presents a Twitter study exploring the metaphorical connotations of the Persian words 'rɒst' and 'ʧæp', and their English equivalents, 'right' and 'left'. The study analyzed sentences containing these words from 2,000 randomly selected tweets in each language, classifying them into positive, negative, or neutral categories based on the valence of the meanings. The results revealed that the word 'rɒst' in Persian had a positive connotation in 68.1% of sentences, while the word 'ʧæp' appeared with negative meanings in 66.5% of sentences. On the other hand, the word 'right' in English had positive meanings in 46.3% of cases, but the word 'left' was predominantly used neutrally. This finding demonstrates a significantly stronger association between spatial words and valence in Persian compared to English.

Next, the study turned to sign languages and investigated how Persian sign language expresses the spatial metaphors in Persian. Chapter Four demonstrated that Persian Sign

Language frequently employs the vertical axis to create metaphors similar to Persian. In Persian Sign Language, the sign for "up" consistently corresponds with positive concepts such as improvement, progress, and goodness, while the sign for "down" metaphorically conveys negative concepts like regression, failure, and badness. This pattern aligns with the metaphorical mappings observed in Persian.

However, a significant difference emerges in the use of the horizontal axis. Unlike Persian, where the words for lateral space carry distinct positive/negative connotations, the signs for right and left in Persian sign language do not convey any positive or negative meanings. This neutrality can be attributed to the nature of sign language. In sign language, as a visual-spatial language, the directionality of signs towards the right or left is determined by the signer's dominant hand. This means that the same sign can appear as a mirror image when used by right-handed versus left-handed signers. The mirror effect of sign language prevents the horizontal axis from being used metaphorically, as in spoken languages. While Persian associates 'right' with positive concepts and 'left' with negative ones, Persian Sign Language exhibits marked neutrality.

In summary, both Persian and Persian Sign Languages similarly use the vertical axis to express positive and negative concepts, but they significantly differ in the association between the horizontal axis and valence. The main question is: Do linguistic variations result in different conceptual systems? To answer this question, this study utilized three non-linguistic tasks to compare participants from Persian, English, and Persian Sign language. The non-linguistic tasks consisted of three tasks: horizontal, vertical, and Four-sided tasks, which were conducted among participants from three different languages.

In the Horizontal task , participants were asked to categorize positive and negative emotions into two boxes on the right and left sides of the screen. The body specificity

hypothesis predicts that all participants, regardless of their language, must put the positive emotion on their dominant side and the negative emotion on their non-dominant side. However, the findings did not confirm this prediction.

The results of the Horizontal task among Persian participants indicate that the significant majority of right-handed individuals placed positive emotions in the right box. This finding is consistent with the observed patterns in the Persian language, where 'rɒst' is predominantly associated with positive meanings. It also aligns with the body specificity hypothesis, which predicts that right-handers tend to associate positive emotions with their dominant hand.

However, the results for left-handed Persian participants are in complete contrast with the predictions of the body specificity hypothesis. The findings show that the majority of left-handed participants preferred to associate positive emotions with the right side of space, similar to the right-handed participants and contrary to their bodily experiences. The result of left-handed Persian participants is consistent with their linguistic experiences and suggests that language can impact how the space-valence association shapes the mind.

The findings from the Horizontal task pose another challenge for the body specificity hypothesis. The results revealed that Persian Sign Language participants, whether right-handed or left-handed, do not associate positive or negative valence with either side of space. This result contradicts the body specificity hypothesis, which expects participants to relate positive emotions to their dominant side. Specifically, bodily experiences were predicted to be more significant for sign language users because they communicate through their hands. Given that the dominant hand serves as the active hand to produce signs in sign language, according to the body specificity hypothesis, one would anticipate

an even more robust mental mapping of "dominant side is good" in Persian sign language participants compared to participants of spoken languages. However, the neutral behavior of Persian Sign Language participants does not support this prediction. Instead, it is more likely aligned with the unbiased nature of horizontal signs in Persian Sign Language. As illustrated in Chapter Three, Persian Sign Language does not attribute positive or negative concepts to the right or left sides of space. The absence of a preference among sign language participants is entirely compatible with their linguistic patterns and supports the study's hypothesis that language can influence the space-valence association in participants' minds.

Furthermore, the comparison between right-handed participants from Persian, a language with a robust space-valence association, and right-handed participants from Persian sign language, which lacks this association, revealed distinctly different behaviors despite both groups sharing the same culture and same handedness. Persian speakers strongly associate positive emotion with the right side, but sign language participants displayed no preference for either side of space. As culture and handedness influenced both groups similarly, the variation in their responses can be attributed solely to language. This outcome supports the significant role of language in shaping the space-valence association in the mind.

As a control task, this study utilized The Vertical task, which examines how participants attribute positive/negative emotions to the vertical axis. The metaphors "good is up" and "bad is down" represent widely recognized mental mappings shared by Persian and Persian sign language. Results of the Vertical task revealed that the majority of participants from both languages, regardless of their handedness, associated positive emotions with 'up' and negative emotions with 'down'. The consistent responses among

all participants suggest that the variations observed in the Horizontal task are likely attributable to linguistic differences rather than random discrepancies.

The final non-linguistic task in this study was the Four-sided task. This task integrated horizontal and vertical spatial dimensions to explore participants' preferences in a complex setup and to control the results of the Horizontal and Vertical tasks. In this task, participants were asked to categorize positive and negative emotions into four boxes located at the up-right, up-left, down-right, and down-left corners of the screen.

The results of the Four-sided task among Persian participants, both right-handed and left-handed, revealed a predominant selection of the upper-right box for positive emotions and the lower-left box for negative ones. This outcome aligns with the results of the Horizontal and Vertical tasks, where positive concepts were attributed to the upper and right sides following Persian language patterns.

In contrast, among Persian Sign Language participants, both right and left-handed individuals predominantly selected the upper boxes for positive emotions without showing a bias between the upper-right and upper-left boxes. Similarly, they mostly placed negative emotions in the lower boxes without demonstrating a preference for the lower-right or lower-left box. This result also corresponds with the findings from the Horizontal and Vertical tasks, indicating that deaf participants, regardless of handedness, associate positive emotions with the upper side and negative emotions with the lower side. At the same time, they have a neutral, no-preference behavior regarding the right and left sides of space. This outcome contradicts the prediction of the body specificity hypothesis and is consistent with their linguistic patterns.

In summary, the results of the four-sided task, as a control task that includes both axes, confirm the findings of the Horizontal and Vertical tasks across all languages. This

outcome supports the conclusion that different linguistic patterns can lead to distinct conceptual metaphors in individuals' minds.

As the results of the non-linguistic tasks demonstrated, the space-valence association in mind can be affected by linguistic patterns. Chapter six of this thesis conducted a linguistic task to explore whether the spatial words in Persian carry an inherent valence or whether the speaker's handedness shapes the valence of these words in speakers' minds.

In this task, participants were asked to evaluate the valence of completely novel words formed by using spatial words 'rɒst' and 'ʧæp'. The findings indicated that both right and left-handed participants exhibited similar patterns, attributing positive valence to compounds containing 'rɒst' and negative valence to those containing the word 'ʧæp'. This outcome suggests that the words 'rɒst' and 'ʧæp' inherently carry strong valence in the minds of Persian speakers, regardless of their bodily experiences.

In conclusion, this study presents two challenges to the body specificity hypothesis. First, the hypothesis suggests left-handed participants should associate positive emotions with their dominant side, the left side. However, the findings showed that most left-handed Persians attribute positive valence to the right side. This result contradicts their handedness experiences but aligns with the prevalent cultural metaphors in their language that 'right is good' and 'left is bad'.

Secondly, despite having similar cultural backgrounds and bodily experiences, Persian speakers and Persian sign language users exhibited distinct behaviors in line with their respective linguistic patterns. These findings suggest that language, contrary to prior assumptions, significantly influences the conceptualization of lateral space. This casts doubt on the body specificity hypothesis, which posits that such associations are purely body-specific.

Finally, this study employed a logistic regression model to assess the impact of three languages and two types of handedness on the preference for selecting boxes on the left or right side of a horizontal axis. The results among participants of the same handedness from three different languages revealed that Persian speakers were most inclined to associate positive emotions with the right side. In contrast, Persian Sign Language users showed a less pronounced preference for either spatial side. This outcome, contrary to the predictions of the body specificity hypothesis, underscores the significant role of language in shaping the space-valence association in speakers' minds.

Conversely, in both spoken languages, left-handed participants demonstrated a reduced tendency to place positive emotions on the right side compared to right-handers. This observation aligns with the body specificity hypothesis, indicating that handedness indeed influences the space-valence association in participants' minds. Overall, the findings suggest an interaction between linguistic patterns and bodily experiences in forming spatial metaphors in the mind.

This study highlights the need for future research to explore a variety of languages, particularly sign languages with their unique patterns, to further illuminate the interaction between language and bodily experiences in shaping mental spatial metaphors, thereby enhancing our understanding of the human conceptual system.

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