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## LITERATURE, LINGUISTICS & CRITICISM | RESEARCH ARTICLE

# Understanding perceptual change as a movement in literal and metaphorical sentences

Omid Khatin-Zadeh<sup>1</sup>, Zahra Eskandari<sup>2</sup>, Hassan Banaruee<sup>3</sup>, María José Seckel Santis<sup>4</sup> and Danyal Farsani<sup>5\*</sup>

**Abstract:** Results of the studies on the way language and body coordinate in communication (through language and gesture) have significant implications for language, education, and cognitive studies. However, there is a lack of convenient research in this area analyzing perceptual changes within individuals. To fill this gap, we investigated the embodied realizations of literal sentences representing perceptual changes and metaphorical sentences describing the phenomena in terms of perceptual changes. We classified sentences that referred to a visual, auditory, haptic, gustatory, or olfactory change. Participants listened to four narratives that contained five literal sentences describing a real perceptual change and five metaphorical sentences that described a phenomenon in terms of a perceptual change. We analyzed the recorded videos of the participants. The total number of literal sentences that described a real perceptual change was obtained for each modality (visual, auditory, haptic, gustatory, olfactory) separately. Also, the total number of gestures used with each category of these literal statements was obtained. Only iconic and non-iconic gestures that described such perceptual changes as the movement of an object in the space were counted. The results revealed that gestures accompanied at least 53% of literal and 56% of metaphorical sentences. These results suggest that literal and metaphorical perceptual change sentences could be understood as movements at a conceptual level. The similarity between embodied realizations of literal and metaphorical sentences supports one of the main assumptions of the strong version of embodied cognition.

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## 1. Introduction

According to Ortony (1979), metaphors are mainly used to describe fewer familiar domains in terms of familiar domains. In fact, Lakoff and Johnson (2003) have emphasized in their Conceptual Metaphor Theory that metaphors are usually used to describe abstract domains in terms of concrete domains. Proponents of the Conceptual Metaphor Theory argue that abstract concepts are understood by mapping them into concrete domains, and this mapping guarantees their Grounding (Borghi et al., 2017). For example, the abstract concepts of “good” and “bad” are understood in terms of right and left in the space (De la Fuente et al., 2016) and the abstract concept of “power” is understood in terms of vertical dimension (Lakens et al., 2011). Metaphors have been investigated from a variety of perspectives in various disciplines. In cognitive linguistics and psycholinguistics, the conceptual processes in metaphor production and comprehension are studied (e.g., Farsani et al., 2022; Khatin-Zadeh, Farsani et al., 2022; Khatin-Zadeh & Khoshshima, 2021; Negro, 2019; Tsaroucha, 2020). Within the fields related to social and cultural aspects of language, metaphors are investigated as tools for social communication (e.g., Martynyuk & Meleshchenki, 2022; Mohnke et al., 2022). Some researchers have looked at metaphors as a process for mathematical cognition (e.g., Khatin-Zadeh, Eskandari et al., 2022; Lakoff & Núñez, 2001; Núñez & Lakoff, 1998). In poetry and literature, metaphor is studied as a figurative tool to beautify language. Regardless of what perspective we take to study metaphor, it is defined as describing and understanding one concept in terms of another, usually a less familiar abstract concept in terms of a more familiar concrete concept (Lakoff & Johnson, 2003). The less familiar abstract and the more familiar concrete concepts are called the target and base of the metaphor, respectively.

Embodied metaphor is an influential view that emerged from embodied theories of cognition. According to this view, metaphoric concepts are often grounded in bodily experiences (Gibbs, 2006; Lakoff & Johnson, 1999). Within this framework, it has been argued that the same neural networks involved in processing the base of a metaphor are also involved in processing the target of the metaphor (Gallese & Lakoff, 2005). It means that the same bodily experiences involved in the meaning of the base of a metaphor are activated when the target of the metaphor is described in terms of its base. For example, in the metaphor *grasping an idea*, the target (understanding an idea) is described in terms of grasping a concrete object. According to embodied metaphor view, processing this metaphor involves activating the neural networks employed to grasp an object. In other words, while processing this metaphor, the experience of grasping an object is activated in the individual’s mind. Likewise, when the metaphor *we are approaching holidays* is processed, the experience of approaching a destination in the physical world is activated.

In this article, we intend to examine the embodied realizations of literal sentences that describe a perceptual change and embodied realizations of metaphorical sentences that describe a phenomenon in terms of a perceptual change. By perceptual change, we mean a change that can be perceived through vision, hearing, touching, tasting, or smelling. First, we discuss two types of sentences that refer to perceptual change: 1) literal perceptual change sentence is a literal sentence that refers to a real perceptual change in the environment (perceptible change); 2) metaphorical perceptual change sentence is a sentence that describes a phenomenon in terms of a perceptual change (non-perceptible change). Then, we discuss the five sensory (visual, auditory, haptic, gustatory, olfactory) and motor dimensions in these two types of sentences. This will be followed by reporting an experiment that examined the embodied realizations of literal sentences that refer to a real perceptual change and metaphorical sentences that describe a phenomenon in terms of a perceptual change. This experiment aimed to find how various

sensorimotor dimensions of perceptual change are embodied when we refer to a real or a metaphorical perceptual change.

## 2. Literal change vs. metaphorical change

As mentioned, a literal perceptual change sentence refers to an actual change in the physical environment. For instance, the sentences, *his body shape has changed and become much bigger*, *there has been a change in the color of the trees*, *migration policies have changed and stink*, and *her voice has changed and become rough*, and *the drink has changed and now has a slightly bitter taste*, describe some real changes in the physical environment that can be perceived through human sensory systems. In other words, the literal meaning of the term *change* refers to an event in the physical environment that can be perceived through one or more senses. For example, the change in the smell of something may be perceived just through the olfactory, and a change in the size of someone's body can be perceived through visual and haptic senses. A metaphorical perceptual change sentence refers to a non-real change in the physical environment. In these metaphors, a phenomenon is metaphorically described in terms of a change in the physical environment. Similar to the literal perceptual change sentences, the metaphorical change may occur in various sensory modalities. In the metaphorical sentence, *the light of hope gradually appeared on the horizons*; an event is metaphorically described in terms of a change in the light, which is a change in the visual modality. In the metaphorical sentence, *the footsteps of spring can be heard gradually*; spring is metaphorically described in terms of an animate being whose footsteps become louder and louder gradually. This metaphor is based on a change in the auditory modality. The metaphorical perceptual change sentences are not restricted to visual and auditory modalities. They may be expressed as changes in other modalities. The metaphorical sentence *that sweet day changed into a bitter one* describes an event in terms of a change in gustatory modality.

Literal and metaphorical perceptual changes may be expressed not only in terms of changes in the five sensory modalities, but even in terms of a motion in the space. The metaphorical sentences *time is moving fast* and *we have now passed through the most difficult stage of our life* describe events in terms of the motion of physical objects in space. It has been suggested that when an abstract concept is metaphorically described in terms of a motion event, the motor system could play an essential role in processing that concept and grounding it in the physical environment (Khatin-Zadeh et al., 2021). This is particularly the case when such a metaphorical description is supported by gestures that depict that motion event (e.g., Keily, 2019; Wellsby & Pexmann, 2019). When a literal sentence is used to describe an actual motion event in the physical environment or a metaphorical sentence is employed to metaphorically describe a specific concept (or event) in terms of a motion event, gestures can be used to give a visual description of that motion. In such cases, gestures provide some information about that real or metaphorical motion event. If the information expressed by gestures is simultaneously conveyed by the accompanying speech, the information provided by gestures is redundant. Nonetheless, if the accompanying gestures do not express the information communicated by speech, the information provided by gestures is complementary to the information provided by speech. In both situations, gestures could be effective tools for enhancing the process of communication.

When a literal sentence is used to describe a real motion event or a metaphorical sentence is used to metaphorically describe a certain concept (or event) in terms of a motion event, the use of gestures to provide information about the motion event is justifiable. However, we may use gestures to describe a real no-motion change in the environment (change in vision, auditory, haptic, taste, olfactory) or to metaphorically describe a particular concept (or event) in terms of a non-motion concept. In this paper, we specifically intend to address how real and metaphorical changes are embodied in the form of motions and gestures that depict those motions. Furthermore, we want to know why we use gestures to describe real non-motion changes and metaphorical non-motion changes. For example, we may use a literal sentence to describe a change in the sound of an object. However, we may use gestures to describe this real non-

motion change in the physical environment. We also may use a gesture to metaphorically describe a certain event in terms of a change in taste. For example, many Persian native speakers use a gesture with the metaphorical sentence *that sweet day changed into a bitter day*. Such metaphorical description does not involve any motion. But, Persian native speakers use a gesture that shows the movement of an object to describe this event. One possible reason may be that Persian native speakers understand this metaphorical change as a movement and embody it as a motion event, even if this perceptual change does not involve any motion.

In this article, we report an experiment that examined the gestures that accompanied literal sentences that described a real perceptual change in the environment and also gestures that accompanied metaphorical sentences that described a phenomenon (a concept or an event) in terms of a perceptual change in the environment. Participants of the study listened to a set of narratives containing such literal and metaphorical sentences. Then, they were asked to retell the narratives. We examined the gestures that accompanied such sentences to find out how such descriptions are realized in the form of gestures. Based on embodied theories of cognition, we expected potential similarity between gestures that accompanied literal and metaphorical sentences that described real and metaphorical changes.

### 3. Method

#### 3.1. Participants

According to convenience sampling, we randomly selected 30 undergraduate students, all native Persians, at Chabahar Maritime University. As we did not want to control the study population in favor of any particular feature, we recruited a heterogeneous group of participants available on campus. This group consisted of 17 males and 13 females; however, gender was not considered a variable in this study. This sort of non-probability sampling may reduce the risk of skewed data and increase the findings' generalizability.

#### 3.2. Materials

Four short audio narratives were used as the materials of the experiment in this study. Each narrative was about six minutes. Each narrative included 550–680 words. The narratives were in Persian, the native language of the participants. These narratives were titled “visiting a beautiful city”, “meeting an old friend on the beach”, “from hardship to success”, and “hard work and perseverance”. Each narrative contained five literal sentences that described a real perceptual change in the environment: one sentence described a visual change, one an auditory change, one a haptic change, one a gustatory change, and one an olfactory change. Also, each narrative contained five metaphorical sentences that described a phenomenon (a concept or an event) in terms of a perceptual change. One sentence metaphorically described a phenomenon in terms of a visual change. One sentence metaphorically described a phenomenon in terms of an auditory change. One sentence metaphorically described a phenomenon in terms of a haptic change. One sentence metaphorically described a phenomenon in terms of a gustatory change. And one sentence metaphorically described a phenomenon in terms of an olfactory change. The order of the type of metaphorical and literal sentences was randomized across the four narratives. The English translations of metaphors and literal statements are presented in the Appendix.

#### 3.3. Procedure

Before conducting the main experiment of the study, participants were trained in a session. This training was held to reassure the participants would follow the instructions accordingly. Some crucial factors to heed were the angle of the camera, the amount of information retention, and the liveliness of the storytelling, which could be ensured with a training session. In this session, participants listened to one sample narrative. After listening to the narrative two times, they had to retell it in their own words in front of the camera of their computers. The goal of the study was not revealed, as it could affect the performance of the participants in the main experiment of the study. After this training session, participants were provided with detailed instructions about the

procedure and the experiment in order to make sure that they were fully prepared for the main experiment. In the main experiment, each participant sat in front of a computer screen. The audio recording of the first narrative was played in around six minutes. After a ten-second pause, the same narrative was played for the second time. Then, the participants turned on the cameras of their computers and retold the narrative in their own language. They were given six minutes to retell the narrative and provide as many details as they could remember from the narrative. The location of the computer cameras allowed them to record the gestures of participants during retelling the narrative. The same procedure was used for the other three narratives. The order of presenting narratives to all participants was the same.

### 3.4. Data analysis

The total number of literal sentences describing a real perceptual change in the environment was obtained separately for each modality (visual, auditory, haptic, gustatory, olfactory). Also, the total number of gestures used with each category of these literal statements was obtained. In this analysis, only gestures that described such perceptual changes as the movement of an object in the space were counted. Every bodily action that did not show at least two-dimensional space whether in a horizontal or vertical plane were excluded. Therefore, beat gestures (gestures that are aligned with speech prosody) and pointing gestures (gestures that refer to the places of objects) were not counted. Then, a contingency table analysis was used to make a comparison between the numbers of gestures that were used with categories of literal statements describing various perceptual changes. A similar analysis was made for metaphorical sentences that described a phenomenon (concept or event) in terms of perceptual changes. Then, a comparison was made between each category of literal statements that described a perceptual change in a certain modality (e.g., visual) and the corresponding metaphorical category that described a phenomenon in terms of a change in that modality. For example, the number of gestures that accompanied literal sentences that described a real change in visual modality was compared with the number of gestures that accompanied metaphorical sentences that described a phenomenon in terms of a visual change. This analysis was done by calculating the correlation coefficient between the percentages of various categories of literal sentences that were accompanied by gestures and percentages of various categories of metaphorical sentences that were accompanied by gestures. The aim of this analysis was to examine any similarity or difference between literal and metaphorical embodied realizations of sentences that referred to perceptual changes.

## 4. Results

The number of produced literal sentences that described real perceptual changes for each modality has been given in the first row of Table 1. The number of gestures accompanying each category of literal sentences has been given in the second row of this table. In the third row of this table, the percentage of sentences that were accompanied by gestures has been given for each category. A contingency table analysis showed no significant difference

**Table 1. Total count of produced literal sentences describing perceptual changes and the number of produced gestures for each category of sentences**

	Visual	Auditory	Haptic	Gustatory	Olfactory
Literal sentences describing perceptual changes	98	83	69	71	78
Number of gestures that accompanied each category of literal sentences	65	53	38	44	42
Percentage of sentences that were accompanied by gestures	66%	63%	%55	61%	%53



**Table 2. Total count of produced metaphorical sentences describing a phenomenon in terms of a perceptual change and the number of produced gestures for each category of sentences**

	Visual	Auditory	Haptic	Gustatory	Olfactory
Metaphorical sentences describing a phenomenon in terms of a perceptual change	89	78	73	74	68
Number of gestures that accompanied each category of literal sentences	56	46	41	43	39
Percentage of sentences that were accompanied by gestures	62%	58%	56%	58%	57%

between the numbers of gestures that accompanied various categories of literal sentences describing real perceptual changes ( $\chi^2 = 1.0267, p = 0.9057$ ). One significant point about these data was that gestures accompanied at least 53% of sentences of various categories of literal sentences.

The number of produced metaphorical sentences that described a phenomenon in terms of a perceptual change for each modality has been given in the first row of Table 2. In the second row of this table, the number of gestures that accompanied each category of metaphorical sentences has been given. In the third row of this table, the percentage of sentences that were accompanied by gestures has been given for each category. Results of a contingency table analysis showed that there was no significant difference between the numbers of gestures that accompanied various categories of metaphorical sentences describing a phenomenon in terms of a perceptual change ( $\chi^2 = 0.2320, p = 0.9937$ ). One significant point about these data was that at least 56% of sentences of various categories of metaphorical sentences were accompanied by gestures. Looking at this phenomenon from the lenses of gesticulation and embodiment of actions, one might reach a conclusion that multimodality is an inherent natural phenomenon (c.f. Dicks et al., 2006; Jewitt et al., 2001; see, Özyürek, 2014 for temporal and semantic conflation of information from co-speech gestures) along the iconicity of language. However, from a conceptual perspective, iconic and metaphoric gestures are not implied inherent multimodalities. Conceptual knowledge is prone to alterations being exposed to co-speech gesture (for detailed discussions refer to Church & Goldin-Meadow, 1986; Goldin-Meadow et al., 2009; Skipper, 2014). Humans use gestures purposefully to benefit from the accessible space to represent spatial semantics, even language modality can influence our perspective choice (Emmorey et al., 2000). By the same token, gestures appear not to have conventional formats, they were observed as idiosyncratic and optionally employed by some language speakers and not all of them in experiments done by Emmorey et al. (2000).

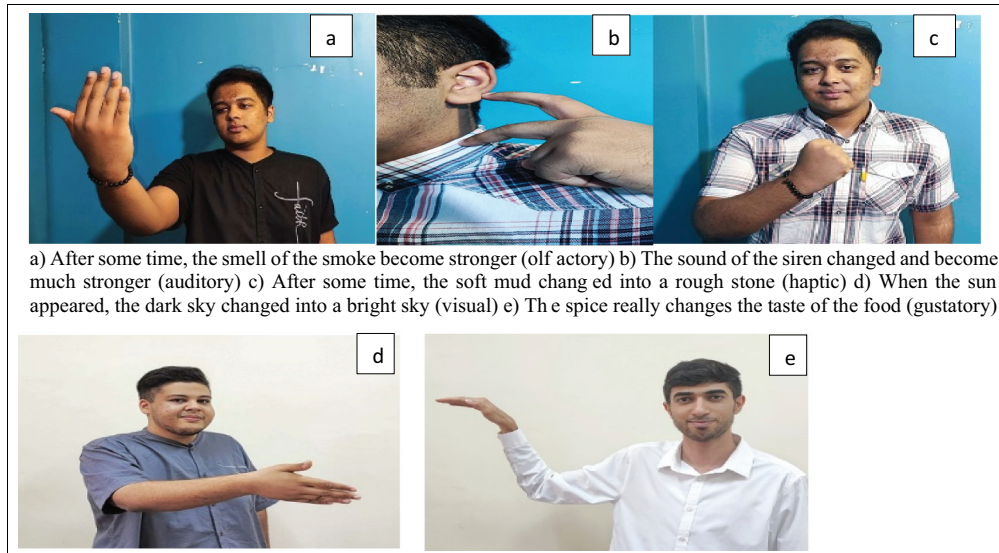
To investigate the correlations between percentages of literal and metaphorical sentences that were accompanied by gestures, a correlation coefficient was obtained. This value was 0.88, which is statistically very significant.

### 5. Discussion

Results of this study showed that over half of the sentences that described a real perceptual change (literal sentences) or a phenomenon in terms of a perceptual change (metaphorical sentences) were accompanied by gestures. The important point about these gestures was that they depicted the movement of an object in the space (as mentioned, only these gestures were counted). Interestingly, this happened for both literal and metaphorical sentences. This suggests that many literal and metaphorical sentences that refer to a perceptual change are embodied as movements in the space at a conceptual level. We discuss literal and metaphorical sentences in two separate subsections to clarify the point.

**Figure 1.** Examples of gestures that accompanied literal sentences in the study. The type perceptual change associated with every gesture is given in parentheses. Note: permission for publishing the photos was obtained from the participants.

**A)** After some time, the smell of the smoke become stronger (olfactory) **B)** The sound of the siren changed and become much stronger (auditory) **C)** After some time, the soft mud changed into a rough stone (haptic) **D)** When the sun appeared, the dark sky changed into a bright sky (visual) **E)** The spice really changes the taste of the food (gustatory).



a) After some time, the smell of the smoke become stronger (olfactory) b) The sound of the siren changed and become much stronger (auditory) c) After some time, the soft mud changed into a rough stone (haptic) d) When the sun appeared, the dark sky changed into a bright sky (visual) e) The spice really changes the taste of the food (gustatory)

### 5.1. Literal perceptual change

The fact that literal sentences describing a perceptual change are accompanied by gestures showing the movement of an object has some important implications. It suggests that two sets of processes could take place when such sentences are used. At the level of speech, the words literally refer to a real perceptual change, which is a literal process. But, at a conceptual level, the accompanying gestures refer to a perceptual change as the movement of an object in the space. This is a metaphorical process. Therefore, it can be said that two sets of processes take place simultaneously or almost simultaneously: a literal process at the level of speech and a metaphorical process at the conceptual level realized in the form of gesture. This means that even literal sentences that refer to a real perceptual change could be embodied as movements in space, and gestures that accompany such sentences are, in fact, the embodied realizations of such sentences. The literal information provided by words of speech and the metaphorical information provided by gestures could be complementary. For example, when it is said *the yellow paper changed into red* and a gesture is simultaneously used to show a slow movement, the gesture could indicate that the change has been slow. While the words literally refer to the event, the gestures refer to it metaphorically. The slowness of the event is not mentioned in words. This information is provided by a slow gesture that describes the event as the slow movement of an object in space. Therefore, the metaphorical process provides some information that is not conveyed through the literal process. Figure 1. illustrates five examples realized gestures of each literal category.

As notable in Figure 1, the speakers used iconic gestures to pass specific information. It is observable that they employed such gestures to convey particular spatial information. Indeed, none of the photos in figure one include beat gestures or pointing gesture, which would be related to the prosody and deictic properties of the language. Deictic gestures are the ones produced by fingers (typically) to indicate the position and location of referents, and beat gestures are produced along with the prosodic features of speech, for instance, to show the stressed word or syllable (McNeill, 1992). These do not share semantic features of the language with the interlocutors. On the contrary, iconic gestures illustrate objects and ideas whether using a 2-D space as a view-point reference or a 3-D space as a bird's view (for detailed discussion refer to Taylor & Tversky, 1992, 1996). To exclude the irrelevant gestures, we benefited from Engle's (1998) argued criteria for gestures that show size scale and viewpoint of the speaker.

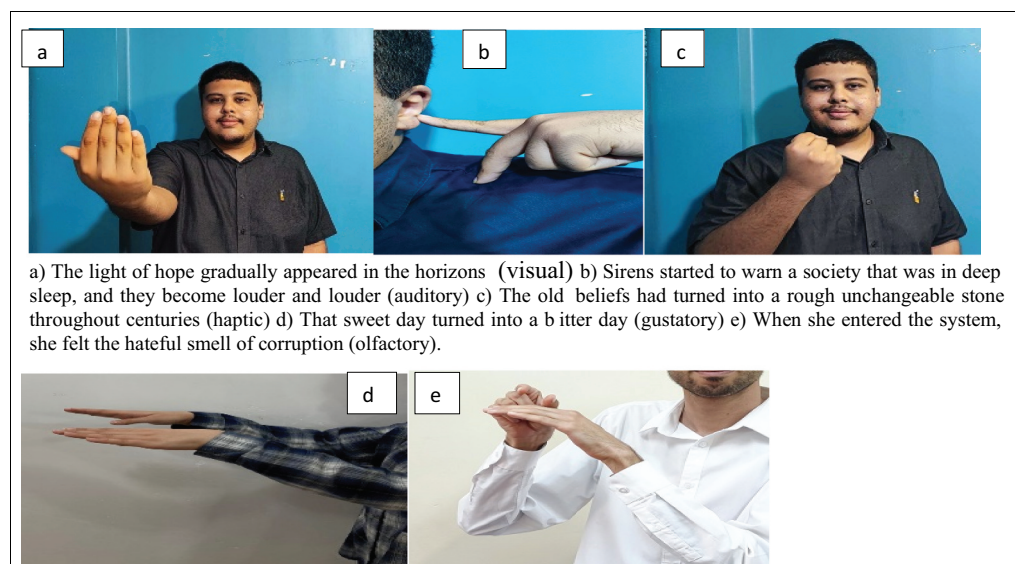


### 5.2. Metaphorical perceptual change

As mentioned, a significant number of metaphorical statements that described a phenomenon in terms of a perceptual change were accompanied by gestures showing the movement of an object in the space. This suggests that perceptual change could be embodied as a movement, be it literal or metaphorical. However, there is a crucial difference between literal and metaphorical sentences. While literal sentences involve a literal process at the level of speech and a metaphorical process at a conceptual level (realized in the form of gesture), metaphorical sentences involve two almost simultaneous metaphorical processes. In the first metaphorical process that takes place at the level of speech, a phenomenon is described in terms of a perceptual change. In the second metaphorical process, the perceptual change is described and shown by gestures. The two metaphorical processes take place almost simultaneously. In the first metaphorical process, the base of the metaphor is the perceptual change, and the target is the phenomenon described in terms of the perceptual change. In the second metaphorical process, the gesture is the base, and the perceptual change is the target. In other words, the base of the first metaphorical process is the target of the second metaphorical process.

An example could make this point more straightforward. Some participants of the study used a gesture that showed the movement of an object away from their field of sight when they used the metaphorical sentence *the dark period of hard economic conditions gradually disappeared*. Here, two metaphorical processes take place. In the first metaphorical process, the change in economic conditions is described in terms of the disappearance of an object. This is a visual change. In the second metaphorical process, this visual change is described in terms of the movement of an object shown by a gesture. In the first metaphor, visual change is the base, and change in economic conditions is the target. In the second metaphor, visual change is the target, and gesture is the base. Therefore, the visual change functions as a bridge between the target of the first metaphor (change in economic conditions) and the base of the second metaphor (gesture showing a movement). In this way, at a conceptual level, change in economic conditions is described in terms of a movement in space shown by a gesture. Although this might be considered as a single metaphor, it is in fact a complex metaphor consisting of two related metaphorical processes.

**Figure 2. Examples of gestures that accompanied metaphorical sentences in the study. The type perceptual change associated with every gesture is given in parentheses. Note: permission for publishing the photos was obtained from the participants. A) The light of hope gradually appeared in the horizons (visual) B) Sirens started to warn a society that was in deep sleep, and they become louder and louder (auditory) C) The old beliefs had turned into a rough unchangeable stone throughout centuries (haptic) D) That sweet day turned into a bitter day (gustatory) E) When she entered the system, she felt the hateful smell of corruption (olfactory).**



### 5.3. Embodiment of literal and metaphorical perceptual changes

As mentioned in the results obtained in this study, there was a strong correlation between the percentages of literal and metaphorical sentences accompanied by gestures. This supports this assumption of the strong version of embodiment that literal and metaphorical sentences are embodied in the same way (Gallese & Lakoff, 2005). For example, in the same way that a literal sentence describing a visual change is understood as a movement, a metaphorical sentence describing a phenomenon in terms of a visual change is also understood as a movement. This suggests that understanding both of them involves the active employment of the motor system because the motor system is the part of our cognitive system that controls body movements such as gestures. Although the production of gestures with literal and metaphorical sentences suggests that producing (or understanding) such sentences involves the active role of the motor system, the absence of gesture during the production of such sentences does not mean that the motor system has not been activated. Indeed, we suggest that even in the absence of gestures, literal and metaphorical sentences that refer to a perceptual change could involve the activation of the motor system. Any literal or metaphorical perceptual change can be understood as a movement in the space at a conceptual level, even in the absence of gesture. This process occurs in mind regardless of whether it is accompanied or not by a gesture. Figure 2 illustrates pictures of embodied realization of metaphorical categories and the gestural realization of their corresponding literal category.

As is observable from photos in Figure 2, speakers have used the space in their vicinity to transfer spatial information and convey perceptual changes. For instance, speaker A depicts a diagrammatic 3-D vision in front to his face to express how hope can rise. In line with Emmorey (2014), this study discourages the monolithic view towards iconicity relying on the similarity of iconic gestures produced in almost half the situations by the participants producing parallel literal and metaphorical utterances. Moreover, the observed similarity in using gesture to produce literal and metaphorical expressions associated with identical perceptual changes indicates existence of similar underlying neural patterns. This confirms the claims by Imai and Kita (2014) that co-activation of sensory motor and linguistic systems lead to realization of embodied language among adults.

## 6. Conclusion

This study's results indicated that people tend to understand perceptual changes as movements in space. Two points were critical about the findings of this study. Firstly, this tendency was observed both for literal and metaphorical sentences. Secondly, it was observed in all perceptual modalities (visual, auditory, haptic, gustatory, olfactory). It should be noted that any change is perceived through one or a combination of several perceptual modalities. Therefore, it can be concluded that any change (literal or metaphorical) can be understood as a movement in space. However, we classified perceptual changes into five categories to obtain a clearer picture of how perceptual changes in various modalities are understood. The understanding of change as a spatial movement is, in fact, a mapping from the domain of spatial movement into the domain of perceptual change. This mapping is essentially a metaphorical process. This metaphorical process takes place even in the sentences that we call literal. As mentioned, literal sentences describing a perceptual change involve a literal and metaphorical process. Finally, it should be noted that our study looked at understanding perceptual change as a movement based on a behavioral experiment. Looking at this question on the basis of neuroimaging data is a question that can be addressed in future research projects. For example, how neural networks of perceptual systems interact with the motor system, which controls gesture and movement, is a question that remains to be met in future neuroimaging studies.

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## **Appendix. English translations of metaphors and literal statements used in the narratives**

### **Literal sentences describing a visual change**

1. When the sun appeared, the dark sky changed into a bright sky
2. The dark clouds changed the sky into black
3. When the lights turned on, the dark stadium changed into a city of colorful lights
4. The rays of the sun changed the dark cave into a bright area

### **Literal sentences describing an auditory change**

1. Her disease changed his voice and made it rough
2. The sound of the car changed and became weaker and weaker
3. The woman changed her voice and made it like the voice of a man
4. The sound of the siren changed and become much stronger

### **Literal sentences describing a haptic change**

1. After some time, the soft mud changed into a rough stone
2. Because of long hours of exposure to sunlight, her soft bright skin changed into a dark rough skin
3. As the temperature rose up, the soft wet land under his feet gradually changed into a rough land
4. Because of high humidity, her dried hairs changed into soft hairs

### **Literal sentences describing a gustatory change**

1. The spice really changes the taste of the food
2. After two days, the taste of the drink changes into sour
3. When the food is cooked for two hours, its taste changes and becomes too hot
4. When the sauce is added to the dish, its taste totally changes

### **Literal sentences describing an olfactory change**

1. Cinnamon totally changes the smell of the mixture
2. When it remains in a closed pot for some time, its smell changes.

3. After some time, the smell of the smoke become stronger
4. The chemical reaction causes a change in the smell

**Metaphorical sentences describing a concept/event in terms of a visual change**

1. The light of hope gradually appeared in the horizons
2. The dark period of hard economic conditions gradually disappeared
3. After some time, the face of the government changed totally
4. The new head changed the face of the company

**Metaphorical sentences describing a concept/event in terms of an auditory change**

1. The voice of the writer was drowning out by people in the position of power
2. The calls for the rights of poor people were gradually turned down
3. Their calls were suffocated by the cruel society
4. Sirens started to warn a society that was in deep sleep, and they become louder and louder

**Metaphorical sentences describing a concept/event in terms of a haptic change**

1. The conditions of the work became rougher and rougher, making it more difficult for a woman
2. The words changed his emotion-less heart into a soft heart
3. The old beliefs had turned into a rough unchangeable stone throughout centuries
4. The hardships of life changed his soft attitudes into hard ones

**Metaphorical sentences describing a concept/event in terms of a gustatory change**

1. That sweet day turned into a bitter day
2. After marriage, they had a sweet life, although it turned into a bitter life later
3. Her sweet smile turned into a bitter one
4. That salty baby was not that much salty anymore

**Metaphorical sentences describing a concept/event in terms of an olfactory change**

1. The smell of failure could be felt gradually
2. The smell of corruption could be felt increasingly
3. When she entered the system, she felt the hateful smell of corruption day by day
4. The smell of life and happiness was becoming prevalent in every corner of her life



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