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Authors

Bostan, İdil Börütecene, Ahmet Özcan, Oğuzhan et al.

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Temporal Expressions in Speech and Gesture

İdil Bostan (idbostan@ku.edu.tr)
Ahmet Börütecene (aborutecene13@ku.edu.tr)
Oğuzhan Özcan (oozcan@ku.edu.tr)

Koç University Arçelik Research Center for Creative Industries (KUAR), Koç University Rumelifeneri Yolu Sariyer 34450 Istanbul – TURKEY

Tilbe Göksun (tgoksun@ku.edu.tr)

Department of Psychology, Koç University Rumelifeneri Yolu Sariyer 34450 Istanbul - TURKEY

Abstract

People use spatial metaphors to talk about temporal concepts. They also gesture frequently during speech. characteristics of these gestures give information regarding the mental timelines people form to experience time. The present study investigates the expression of temporal concepts on a natural setting with Turkish speakers. We found that Turkish speakers used more metaphoric temporal phrases (e.g., short period, time flies quickly) than words referring to time without spatial content (e.g., today, nowadays) in a session where they talked about people's fortune. Spontaneous gestures were mainly classified as metaphoric and beat gestures and were mostly produced on the sagittal axis, which contradicts with the previous findings. Yet, we also found that people used vertical axis to represent current and future events. These findings suggest that lateral axis may not always be the most common direction for co-speech temporal gesture use, and the pragmatic constraints of the environment may influence the spatial conceptualization of

Keywords: time, spatial metaphors, temporal gestures, Turkish

Introduction

Time is an abstract concept that we cannot physically experience through our senses. The need for a concrete ground to perceive and express time has led to the use of spatial metaphors. Space is easier to experience in physical reality, so people usually map their understanding of time onto space (Boroditsky, 2001). People use spatial metaphors to talk about time (e.g., Clark 1973; Evans 2004; Lakoff, 1992). For example, it is common for English speakers to say "move the meeting forward" or "this week has been long." Recent research also suggests that people produce spontaneous gestures to depict temporal information in their gestures (e.g., Casasanto & Jasmin, 2012; Cooperrider & Nunez, 2009). Most of the findings stem from experimental paradigms and many studies use native English speakers as participants. In this study, we investigate native Turkish speakers' use of temporal information in speech and gesture in a natural setting.

Most Western cultures locate future ahead and past in

the back. Other cultures use different variations of time orientation. In Mandarin, for example, even though there is a use of the front-back analogy, people also produce up for future and down for past (Boroditsky, 2001). In Aymara language of the Southern America, front represents past and back represents future (Nunez & Sweetser, 2006). There are many possible explanations to why and how people locate temporal features. One important factor to represent time is the reading and writing direction of speaker's native language (Bergen & Lau, 2012). Most languages perceive earlier events at the left or back of the self and future events at the right or front of the self. Using nonlinguistic tasks, Ouellet and colleagues (2010) found that Hebrew speakers demonstrated the opposite pattern of right to left flow of time in line with their right to left reading-writing direction. Spanish speakers have the opposite representation of time, not only in visual tasks, but also in auditory tasks. Similarly, Fuhrman and Boroditsky (2010) showed that when asked to temporally order pictures, English speakers (left to right) put earlier events to the left side of space, whereas Hebrew speakers (right to left) put the same events to the right side of space (see also Boroditsky, Fuhrman & McCormick, 2011). These findings present the impact of reading-writing direction on other modalities. Thus, in nonlinguistic tasks, the representation of time seems to be influenced by one's native language's characteristics.

People's representation of time based on space can also be apparent in their expressions of time in both speech and gesture (Casasanto & Jasmin, 2012). That is, people talk about time with regard to space in spatial metaphors. In English, these metaphors can be in a deictic form with a reference to a certain time point (e.g., it happened *way back* in the past), or may not include any directionality information at all (e.g., a *long time* has passed). The frontback analogy is the most dominant spatial axis in English language, with a few exceptions of other directions (e.g., the meeting is coming *up*). However, this kind of use is not systematic (Casasanto & Jasmin, 2012).

Do gestural expressions follow verbal temporal information? Speech and gesture form an integrated language system (McNeill, 1992). As a result, gesture is

often used as another source to understand the underlying mechanisms of cognitive functions. Gestures are also spatial in nature and can be suitable to embody the content of temporal speech. Gestures can be classified into four main categories: *iconic* gestures that represent actual objects or actions, *metaphoric* gestures that refer to abstract ideas or concepts, *deictic* gestures that involve pointing to an object or location, and *beat* gestures, which are quick hand movements to supplement information in speech (McNeill, 1992). If speech and gesture are temporally and semantically integrated, then the descriptions of temporal relations should be similar in each modality.

Cooperrider and Nunez (2009) suggest that English speakers' use of gestures is very predictable based on the writing direction and their cultural conceptualizations of time. Previous studies suggest that English speakers gesture both on the left-right and front-back axes depending on the task (Casasanto & Jasmin, 2012). When asked to gesture deliberately, deictic metaphors invoke a sagittal mental timeline, whereas sequential metaphors prime speakers to a lateral timeline. English speakers refer to the sagittal axis (from back to front) rather than lateral axis (from left to right) while speaking metaphorically about time. Yet, they dominantly use lateral axis in their spontaneous co-speech gestures about time (Casasanto & Jasmin, 2012). This dissociation points to an implicit placement of sequential events on the lateral axis.

Turkish is another left to right flowing language based on the reading-writing direction. Turkish speakers also refer to time in spatial metaphors and represent it as a physical entity (Ördem, 2014). Phrases like *O günler arkada kaldı* ("those days are *behind* us") show Turkish speakers' use of sagittal axis while referring to time. Turkish and English speakers' expressions of time display parallels in the conceptualization of time as a spatial motion or a location in space. Additionally, the developmental stages that lead to an adult understanding of time are similar between two language groups when their linguistic comprehension of metaphors regarding time is measured (Özçalışkan, 2004).

Even though there is accumulating evidence on how people talk and gesture about time, detailed investigations of temporal expressions in both speech and gesture in languages other than English are still insufficient and there is room for new findings. In languages, several categories such as duration, tense, sequence time, deictic time, and metaphors are used to define time (Le Guen & Balam, 2012). This paper focuses on two time concepts: duration and spatial metaphors to express time.

To understand the mapping between specific temporal expressions and their gestural construals, in this study we investigate the types and axes of the gestures people perform while referring to the past, present, and future as well as different types of temporal expressions. In a naturalistic study, we provide a comprehensive examination of speech and gesture relations by focusing on both time words without a spatial content (e.g., today, tomorrow) and spatial metaphors (e.g., before, short time) and providing

both quantitative and qualitative analyses. We predict that due to the abstract nature of time concept, regardless of the type of phrase, people would produce more metaphoric gestures than any other types. If individuals' gestural expressions directly map onto verbal expressions, gestures would follow the timeline depicted in speech.

Method

Participants

Eighteen native Turkish speakers participated in the study. They were all undergraduate or graduate students ($M_{age} = 22.4$, SD=2.1, 15 females). These individuals were the speakers (see more information below). In addition, two individuals participated as listeners.

Materials and Procedure

This study used naturalistic fortune telling sessions as the design. Turkish fortune telling sessions provide a viable setting to assess temporal information. In Turkey, coffee fortune-telling is a widespread practice interwoven in daily life and considered by most people as an occasion for creating social interaction. Moreover, Turkish coffee drinking and fortune telling sessions create an enjoyable, warm and sometimes humorous social environment. In Turkish culture, it is very common for people to tell others' fortune by examining the coffee cup after drinking coffee. Both the fortuneteller and the listener (the person who drank the coffee) are engaged and attentive in this interaction (see Figure 1). The fortunetellers' narratives involve rich verbal and non-verbal information. Furthermore, the contents of fortune telling involve the past, present and future of the fortune receivers' lives, which provide abundant natural temporal data to be examined. That is, fortune telling is a good setting for us to examine temporal speech and gesture interaction.



Figure 1: The setting of a coffee cup fortune-telling session

Fortunetellers (speakers in this study) were recruited among graduate and undergraduate students around the university campus who were passionate about fortune telling and performed it occasionally. Listeners of the fortunes were two female students who were willing to hear their fortunes. The listeners were blind to the research questions. In the sessions the fortuneteller, the listener, and the

researcher were present. To maintain an environment of natural conversation, sessions were held in coffee houses around the campus and the city. Researcher did not intervene in the process and merely recorded the session. Fortuneteller and the listener sat face to face, on opposite sides of a table. Their hands were free to move and they were able to hold or let go of the coffee cup whenever they wished to, as would be in a regular coffee drinking setting. Overall, the physical setting of the experiment resembled any two people sitting and chatting in a coffeehouse, with the sole addition of a camera recording the interaction. There was no limit to the duration of the session, but most of them averaged around 10-15 minutes. Before each session the fortunetellers were asked to complete an informed consent form and a questionnaire with demographic questions.

The sessions were video recorded with a smartphone camera. The camera was positioned to frame the hands, arms and faces of both participants to record the body movements. A small tripod was used to capture a stable footage. No instructions were given regarding gesture use.

Coding

Speech. All speech was transcribed by native Turkish speakers. First, phrases that involved temporal sentential meaning were identified such as bu ara çok şanslı olacaksın ("you are going to be very lucky these days"). Then, temporal phrases were coded into two levels of meaning: Literal temporal phrases (LP) or metaphoric temporal phrases (MP). LPs were the ones that refer to time and did not involve any spatial content, such as simdi ("now"). MPs had some metaphoric meaning in them, expressed by the spatial words, such as kisa süre ("short period"). This was a delicate process since many spatial metaphors of time have been embedded so deeply in Turkish language that they may seem like literal at first glance. For example the word önce (before) comes from the root ön, which means front, a spatial concept (Gentner, Imai & Boroditsky, 2002). Although önce seems to be a literal phrase, this little distinction makes it a subtle metaphorical one. Similarly bir yıl içinde (in one year) has a spatial component based on the preposition içinde (in). To overcome this problem, we first categorized phrases into three categories as Literal, Metaphorical and Subtle-metaphorical. Yet, after analyzing all of them separately, we found the two metaphorical groups vielded similar results in people's gesturing patterns so we reported them as one MP category. Temporal phrases were also coded according to their temporal orientation of the sentence: phrases regarding past (e.g. *öncesi* "before"), present (e.g. bugünlerde "nowadays"), or future (e.g. gelecekte "in the future").

Gesture. The gestures that accompanied temporal phrases were identified. A change in the shape of the hand or motion signaled the end of a gesture. Gestures were first categorized according to their types: metaphoric, deictic or beat gestures. Because all iconic gestures referred to an

abstract concept, we categorized them as metaphoric (from now on we will only use metaphoric to refer to these types of gestures). Manipulative gestures were also needed to be included because fortune telling takes place by referring to the visual stimuli inside the coffee cup, so it was common for the participants to move or twirl the cup to be able to see better.

Gestures were then categorized according to the axis, in which the gesture took place. There were four different axes: sagittal, lateral, vertical, and diagonal (see Figure 2). The sagittal axis refers to the front-back orientation, lateral axis refers to the left-right orientation, vertical axis refers to the up-down orientation, and diagonal refers to any combination of these axes. After the axis was identified, the direction of the gesture was also coded. This involved several categories within the axis: to *left* and to *right* for lateral, up and down for vertical, forwards and backwards for sagittal, and any combination of these six directions for diagonal. If the gesture did not occupy any of these axes, but was only a movement within the same space or a change in the posture of the hand, it was coded as no-axis. Mostly beat gestures were coded as no-axis gestures. Finally, for deictic gestures, their reference point was also coded. For example, if they pointed to the ground, the gesture was coded as vertical axis, downward direction.

The interaction between gesture and speech was also coded for the match in meaning between both modalities. From the previous research we know that cultures, who write from left to right tended to put future in the front, up, and to the right, whereas they perceived past in the back, down, and to the left (Bergen & Lau, 2012; Casasanto & Jasmin, 2012; Ouellet & Santiago, 2010). With this expectation, whenever a temporal phrase matched with this formula it was coded a "match" and a "mismatch" when the phrase and gesture carried the opposite meanings. For example, when a forward gesture co-occurred with the word "later", it was a match situation. In contrast, if the gesture points at the back, while saying "later," we coded it as a mismatch.



Figure 2: (top left) lateral axis, (top right) vertical axis, (bottom left) sagittal axis, (bottom right), and diagonal axis as a combination of any other axes

Results

Speech. A total of 227 temporal phrases were identified. Three participants did not use any temporal phrases during their sessions, so they were excluded from the analysis. In total, 64 phrases (28.19%) were LPs and 163 phrases (71.81%) were MPs. The difference between the use of different types of phrases was statistically significant, χ^2 (1, 227) = 43.18, p < 0.001. The total of 227 phrases consisted of 72 unique temporal phrases. While some phrases like "now" were repeated several times across several participants, some like "its time will come" were used only once (see Appendix A for all types of phrases). Of all the phrases, 23% of them referred to the past, 22% referred to the present, and 55% referred to the future.

Gesture. Among the 15 participants, there were 102 gestures that were accompanied by temporal speech. All these remaining participants gestured at least once and at the most 21 times. Of all temporal speech, 45% involved temporal gesture use. Each participant used at least one temporal gesture. Of the 102 gestures, 32 (31.37%) were metaphoric, 8 (7.84%) were deictic, 59 (57.84%) were beat, and 3 (2.94%) were manipulative gestures. Difference among gesture types was significant, χ^2 (3,102) = 73.43, p < 0.0001. Thus, people mostly produced beat and metaphoric gestures during temporal expressions.

People expressed time using either one of the 4 axes (sagittal, vertical, lateral, diagonal) or no axis at all. 60.78% of all gestures were performed without an axis. Among those gestures that were made within an axis, 42.5% were in sagittal, 7.5% were in lateral, 37.5% were in vertical, and 12.5% were in diagonal axes, χ^2 (3,40) = 14.8, p < 0.001. The majority of no-axis gestures were beat gestures (87.1%). As seen in Table 1, most metaphoric gestures consisted of sagittal (40.63%), vertical (25%), and no-axis (15.63%) gestures.

Table 1: Gesture Type – Axis Interaction

Axis/ Type	Sagittal	Lateral	Vertical	Diagonal	No Axis
Metaphoric	13	3	8	3	5
Deictic	1	0	5	1	1
Manipulative	1	0	0	0	2
Beat	2	0	2	1	54

The use of gesture types was similar for both temporal speech types, as shown in Table 2. Beat and metaphoric gestures were the most common types with a significant level of difference among gesture types for both LP, χ^2 (3,32) = 23, p < 0.0001, and MP χ^2 (3,70) = 55.14, p < 0.0001 (see Table 2).

Table 2: Gesture Types According to Temporal Speech Type

Gesture type	Literal Phrases	Metaphoric Phrases		
	Number-Percentage	Number-Percentage		
Metaphoric	10 (31.3%)	22 (31.4%)		
Deictic	4 (12.5%)	4 (5.7%)		
Beat	18 (56.3%)	41 (58.6%)		
Manipulative	0 (0%)	3 (4.3%)		

Although the use of gesture types did not differ between literal and metaphorical uses of temporal speech, there were differences in the use of gesture axis. Vertical and no axis gestures are the most common in LPs with a significant level of difference, χ^2 (4,32) = 35.5, p < 0.0001. While no axis gestures were still the most common type in MPs, the use of vertical gestures decreased and the use of sagittal gestures increased compared to LPs. The difference in the use of gesture axis was also significant for MPs, χ^2 (4,70) = 87.43, p < 0.0001.

Detailed analysis of this gesture-speech interaction results provided some interesting findings. Among all 15 vertical gestures, 6 of them accompanied by the word "now" and 1 accompanied "today" with a downward motion. Although there were more MP gestures in all gesture axes due to higher number of metaphorical phrases, vertical axis was an exception: There were more vertical gestures in LPs compared to MPs.

Table 3: Axes According to Temporal Speech Type

Gesture Axis	Literal Phrases Number- Percentage	Metaphoric Phrases Number-	
			Percentage
Sagittal	2 (6.3%)	15	(21.4%)
Lateral	0 (0%)	3	(4.3%)
Vertical	10 (31.3%)	5	(7.1%)
Diagonal	2 (6.3%)	3	(4.3%)
No Axis	18 (56.3%)	44	(62.9%)

Finally, almost all meaningful gestures that were not beat gestures (except 1 of them) matched with the accompanied speech. For example, when people talked about time on a sagittal axis, they put the future events in front of their bodies and past to their back. Similarly, earlier events were represented on the left and future events were put to the right of the body.

Discussion

The present study investigated temporal speech and spontaneous gestures accompanying temporal phrases during a natural conversational setting in Turkish. We found that Turkish speakers used many spatial metaphors to express time, and the use of these metaphorical references for time was twice as many than the use of literal time words. Almost half of the temporal phrases were accompanied by spontaneous gestures. Beat and metaphoric gestures were the most common gestures among all types.

In contrast to findings in English, (Casasanto & Jasmin, 2012), the sagittal axis was the dominant one used for spontaneous temporal gestures in Turkish along with the use of vertical axis gestures. Previous studies did not report the use of vertical axis in temporal gestures.

In the present study, we made a detailed examination of temporal phrases. In a setting when someone talks about the past happenings and possible future events, time is mainly expressed using space. Phrases that are not necessarily considered as spatial can have spatial meanings in Turkish. In addition, Turkish language is very rich in using spatial metaphors. For example, to talk about a past event that the person has close connection with; one can use several metaphors such as geçmişe bağlılık (connection to the past), geçmişi anmak (remembering the past), geçmişle bağları koparmak (loosing the connection with the past) or geçmişte kalmak (stay in the past). As a result of these, people produce many different types of spatial metaphors in Turkish. We also propose that the level of abstractness in metaphors would differ. In some phrases such as aradaki 1 ay (one month in between) may be less abstract than zaman harcamak (to spend some time). Yet, in this natural setting we did not observe enough instances to make a distinction for the level of abstractness in spatial metaphors. Future studies need to consider these differentiations in the use of space to describe time and investigate the level of abstractness in metaphors in experimental settings.

People attempt to visually support the conveying temporal message with gestures, which is more difficult to comprehend as an abstract concept. This is true for both literal and metaphoric use of temporal phrases. The use of metaphorical gestures is meaningful in this sense. When people talk about an abstract concept, they may supplement it with co-occurring semantic gestures like metaphoric ones. Yet, people also produced many beat gestures. The use of these meaning-laden beat gestures may help individuals to plan for their conversation and may benefit the speaker thinking about the abstract concept while preparing to talk about it. The temporal synchrony between speech and gesture can provide us information about the different functions of metaphoric and beat gestures, which is a question for future research.

Regarding the gestural axis, our findings contradict the previous research that used story prompts are given in story telling situations (Casasanto & Jasmin, 2012). The sagittal axis was the most commonly produced timeline in spontaneous gestures. In a natural setting when people talk about time without any study prompts, they used very few gestures on the lateral axis. One reason could be due to the nature of the conversation. In this fortune telling sessions as people focus on talking about the future (55% referred to the future events) and the listener sits across the person, it can be inevitable to use sagittal gestures. The teller refers to the person to express ideas about what can happen for future events. Thus, using the sagittal axis in this context can be more pragmatic than using the lateral axis.

In our analyses, we coded 2 additional categories for gesture axis: diagonal and vertical. Overall, people produced very few gestures using a mixture of sagittal and lateral axes (diagonal). Yet, most of the deictic gestures and 25% of the metaphoric gestures (8 out of 34) were produced using a vertical axis. This shows that to represent a present moment or current events such as "now" or "in the near future" people can use a vertical axis to refer to these by pointing the front of their bodies. These gestures are not only simple pointing gestures, thus the exact purpose of this axis also needs further investigation in an experimental setting.

One limitation of the current study is that the majority of temporal gestures come from a few participants, while others perform 3.5 gestures on average per person. Further studies need to work with a larger sample size to overcome these imbalances and have a more homogeneous sample.

Taken together, this study contributes to the literature on speech-gesture interaction in expressing temporal events. As in line with studies conducted in English, we presented evidence for the heavy use of spatial metaphors. However, metaphoric gestures are produced on a sagittal axis during natural conversation settings, suggesting that not all types of settings and/or languages invoke the use of lateral axis for spontaneous temporal gestures.

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Appendix A.

Time expressed in literal and metaphorical phrases.

Literal Phrases

...'dan beri "since" 1.5 ay "1.5 months" 2 vakte kadar "until 2 times" Aylardan beri "for months" Aynı zamanda "at the same time" Bir anda "suddenly" Bir gün "one day" Bir süre daha "a while longer" Bugün "today" Eskisi "old" Geçmiş zaman "past time" Geçmişte "in the past" Gelecek "future" Ne zaman ... o zaman "when ... then" Olacak zaman "times to come" Şimdi(lik) "now (for now)" Şu an/saat/tarih "this moment/hour/date" Zamanında "in the past"

Metaphorical Phrases

1 yıl içinde "in 1 year" 3-4 ay sonra "3-4 months later" Aradaki 1 ay "I month in between" Arkası(ndan) "after/behind (after that)" Az önce "a moment ago" Bir ara "some time" Bir süre sonra "a while later" Biraz zaman önce "a while ago" Bu ara/dönem/sıralar "these days/nowadays" Daha önce "before" Geçmiş bir yerde kalmış "past is stuck" Geçmişe bağlılık "connection to the past" Geçmişi anmak "remembering the past" Geçmişle bağları koparmak "losing connection with past" Gecmiste kalmak "stay in the past" Geçtiğimiz 2 yıl içinde "in the last 2 years" Geride kalmak "left behind" İleride(si) "ahead" Kısa süre/vade "short period/duration" Kısa zaman sonra "short while later" Önceki süreç "previous term" Öncesi "before" Önümüzdeki 3 ay/dönem "next 3 months/term" Onündeki süreç "period ahead" Orta vade "medium duration" Sonra "Later" Sonraki günler "Days after" Sonrası(nda) "After (that)" Şu sıralar "recently" Uzun süre/vade "long period/duration" Vakit vermek "to give time" Vakti olmak "to have time" Yakın zaman "close time" Zaman almak "to take time" Zaman geçirmek "to spend time" Zaman girmiş "time came between" Zaman sıkıştırıyor "time rushes" Zaman tanımak "to give time" Zamana bırakmak "to let time go by" Zamanı gelmek "time has come" Zamanı var "there is time"