Gesture use in L1-Turkish and L2-English: Evidence from emotional narrative retellings

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Abstract

Bilinguals tend to produce more co-speech hand gestures to compensate for reduced communicative proficiency when speaking in their L2. We here investigated L1-Turkish and L2-English speakers' gesture use in an emotional context. We specifically asked whether and how (1) speakers gestured differently while retelling L1 vs. L2 and positive vs. negative narratives, and (2) gesture production during retellings was associated with speakers' later subjective emotional intensity ratings of those narratives. We asked 22 participants to read and then retell eight emotion-laden narratives (half positive, half negative; half Turkish, half English). We analyzed gesture frequency during the entire retelling and during emotional speech only (i.e., gestures that co-occur with emotional phrases such as "happy"). Our results showed that participants produced more representational gestures in L2 than in L1, however, they used more representational gestures during emotional content in L1 than in L2. Participants also produced more co-emotional speech gestures when retelling negative than positive narratives, regardless of language, and more beat gestures co-occurring with emotional speech in negative narratives in L1. Furthermore, using more gestures when retelling a narrative was associated with increased emotional intensity ratings for narratives. Overall, these findings suggest that (1) bilinguals might use representational gestures to compensate for reduced linguistic proficiency in their L2, (2) speakers use more gestures to express negative emotional information, particularly during emotional speech, and (3) gesture production may enhance the encoding of emotional information, which subsequently leads to the intensification of emotion perception.

Keywords: gesture, bilingualism, multimodal communication, emotion, narrative production

Gesture use in L1-Turkish and L2-English: Evidence from emotional narrative retellings

People produce co-speech hand gestures spontaneously as they speak. Gestures serve many functions both for speakers and listeners during communication (Butterworth & Hadar, 1989; for a review, see Hostetter, 2011; Kendon, 1994; Kita, 2000; Krauss, 1998; Kelly, 2001; Rauscher et al., 1996; Valenzeno et al., 2003). Speakers might use gestures for communicative purposes; they employ gestures to convey semantic information in coordination with the speech during speaking (Alibali et al., 2001; Bavelas et al., 2008). Gestures also alter speakers' internal cognitive processes by affecting subsequent learning and information encoding (for a review, see Goldin-Meadow, 2010). Bilingualism provides a valuable testbed to investigate the use and roles of gestures for communication given that bilinguals' communicative proficiency differs across their dominant (L1) vs. non-dominant (L2) languages (e.g., Nicoladis et al., 2007). Indeed, studies showed that speakers produced more gestures when speaking in their L2 than L1 to compensate for weaker communicative abilities in their L2 (e.g., Nicoladis et al., 2007). People use many gestures in spatial contexts across different cognitive domains (i.e., language acquisition, speech production, speech comprehension) as they are particularly adept at expressing visual-spatial information (e.g., for a review, see Alibali, 2005; Feyereisen & Havard, 1999). It is important to study gesture use in non-spatial contexts (e.g., abstract concepts) as people integrate various abstract concepts (i.e., emotions) into their speech during communication (Andersen & Guerrero, 1997; Waldron, 2012), which may be expressed through their gestures. Focusing on gesture use in non-spatial contexts across L1 and L2 also allows us to see the extent to which bilinguals benefit from gestures while communicating information about abstract concepts. The current study focused on bilinguals' co-speech gesture use across their L1 vs. L2 with a new angle by providing evidence from emotional communication context. It is important to note that participants in the current study are not

simultaneous bilinguals who acquired two languages from birth with relatively balanced competence in both languages. Rather, current study examines *sequential bilinguals,* who acquired their second language (i.e., English) at later stages in their lives than their first language (i.e., Turkish).

Gestures' role in communication for bilinguals

Speakers tend to accompany their speech with concurrent hand gestures. There are different classifications of gestures in the literature (Ekman & Friesen, 1969; Kendon, 1980; McNeill, 1985, 1992). For example, McNeill (1992) classifies hand gestures into four categories: iconic, metaphoric, deictic, and beat gestures. *Iconic* gestures are hand movements linked to the concrete semantic content of the speech (e.g., bringing hands together in a circular manner to depict a "ball"). *Metaphoric* gestures represent the abstract semantic parts of a spoken message (e.g., pushing both hands away from the body while saying "he let all his emotions out."). *Deictic* gestures involve pointing with fingers or hands to concrete or abstract entities (e.g., pointing to a cup with the index finger). *Beat* gestures are small biphasic hand movements that go along with the rhythm of the speech and do not convey any semantic information. While iconic, metaphoric, and deictic gestures are often classified as *representational*, beat gestures are considered *nonrepresentational* gestures (e.g., Feyereisen & Havard, 1999).

Gestures serve many functions during language production. One account suggests that gestures have intra-speaker cognitive functions by affecting speakers' internal cognitive processes (Alibali et al., 2000; de Ruiter, 1998; Freedman, 1977; Goldin-Meadow et al., 2001; Hadar & Butterworth, 1997; Kita et al., 2000; Krauss et al., 2000; Melinger & Kita, 2007; Rauscher et al., 1996; Wagner et al., 2004). For example, gestures benefit speech production processes by facilitating lexical retrieval or organizing discourse (Kita et al., 2000; Rauscher et al., 1996). On

the other hand, another account emphasizes the communicative functions of gestures (Beattie & Shovelton, 1999; Clark, 1996; Goodwin, 2000; Hostetter, 2011; Kendon, 1994). Gestures are semantic entities, and speakers employ gestures to communicate information (e.g., Alibali et al., 2001; Krauss et al., 1995; Özyürek, 2002). Earlier studies suggested that gestures are communicatively intended and thus, how and to what extent speakers employ gestures differ according to the needs of different communicational contexts. For example, speakers used a higher frequency of gestures and more salient gestures (i.e., larger and more complex gestures) when their audience is naïve compared to familiar with the conversation topic (Campisi & Özyürek, 2013; Holler & Stevens, 2007; Holler & Wilkin, 2009; Jacobs & Garnham, 2007; Schubotz et al., 2019) and when their interlocutors can see them compared to when they cannot (Alibali et al., 2001; Bavelas et al., 2002; Bavelas et al., 2008; Mol et al., 2011). These findings corroborate the notion that gestures have communicative functions and speakers produce gestures to enhance communication.

Gesture and speech have different mediums of expression (visual-manual vs. auditory-vocal); however, they are related on the semantic level (McNeill, 1992). During communication, speakers coordinate speech and co-speech gestures and distribute semantic information across different communication channels (speech vs. gesture; de Ruiter et al., 2012; Melinger & Levelt, 2004). Thus, speakers might use gestures as an alternative channel of expression when the verbal channel (i.e., speech) is compromised or requires more effort (e.g., Bangerter, 2004; de Ruiter et al., 2012). Previous research suggests that linguistic proficiency plays a crucial role in how and to what extent speakers employ gestures (for a review, see Özer & Göksun, 2020). For instance, people with lower verbal abilities (e.g., lower verbal working memory or linguistic fluency) used more gestures compared to people with higher verbal abilities (Gillespie et al., 2014; Hostetter &

Alibali, 2007, 2011; Smithson & Nicoladis, 2013) and children with their not fully developed verbal skills might benefit more from gestures as an alternative channel to convey information compared to adults (e.g., Colletta et al., 2010). In line with this, studies also showed that speakers and listeners benefit more from gestures in challenging communicative situations, such as speaking in noisy environments in which the intelligibility of the spoken channel is reduced (e.g., Drijvers & Özyürek, 2017; Drijvers et al., 2018; Trujillo et al., 2021) or in their L2 in which linguistic proficiency is hindered compared to their L1 (e.g., Dahl & Ludvigsen, 2014; Drijvers & Özyürek, 2018, 2020; Sueyoshi & Hardison, 2005). Together, these findings indicate a trade-off between speech and gesture in different conditions (e.g., linguistic proficiency, verbal abilities, cognitive capacity, the native status of the speakers). Thus, we remark that speakers benefit from gestures as an alternative communication channel to convey information when spoken communication is compromised.

Considering all these, examining co-speech gesture use across L1 vs. L2 provides a valuable testbed to investigate the communicative roles of gestures during language production. Earlier research consistently showed that bilinguals produced more gestures while communicating in L2 than L1 (Gullberg, 1999; Nagpal et al., 2011; Nicoladis et al., 2007; Zhao, 2006). This difference between L1 and L2 in gesture production is modulated by neither task complexity, task difficulty, nor L2 proficiency (Nagpal et al., 2011; Nicoladis et al., 2007). Instead, it might be related to the verbal abilities bilinguals lack in their non-dominant language (Smithson & Nicoladis, 2013), based on the presumption that they are more proficient in their dominant language, particularly for sequential bilinguals who acquired their L2 later in life compared to their L1 (Marcos 1979; Nicoladis et al., 2007). Furthermore, since communicating in a non-dominant language is cognitively more challenging (Nawal, 2018; Sweller et al., 2011; Schoonen et al.,

2003; Weigle, 2005; Zabihi, 2018; Zimmerman, 2000), bilinguals might benefit from using gestures more to reduce their cognitive load and overcome this cognitive challenge while communicating in their non-dominant language. On the other hand, there are inconsistent findings regarding the types of gestures produced by bilinguals in their L1 vs. L2 (Marcos, 1979; Nicoladis, 2007). Some studies showed that not only bilingual adults (e.g., Gullberg, 1999; Nicoladis et al., 1999), but also bilingual preschoolers (e.g., Nicoladis, 2002) used more iconic gestures in L1 than L2, whereas others found either no difference regarding different types of gesture use between L1 and L2 (Marcos, 1979; Nagpal et al., 2011; Sherman and Nicoladis, 2004) or that bilinguals use more iconic gestures in L2 than L1 (Nicoladis et al., 2007). However, studies consistently demonstrated that bilinguals produced more deictic gestures in L2 than L1 (Gullberg, 1999; Marcos, 1979; Nicoladis et al., 2007; Pika et al., 2006; Sherman & Nicoladis, 2004). One important thing to consider regarding earlier research is that they mainly examined bilinguals' gesture use in spatial contexts for which gestures are particularly helpful (e.g., Alibali, 2005; Nagpal et al., 2011). The current study provides a new angle to the literature by examining bilinguals' gesture use in a non-spatial, emotional context.

How does speech content affect gesture production? Given their medium of expression, gestures are particularly adapted at expressing visual-spatial information (Feyereisen & Havard, 1999; Lavergne & Kimura, 1987). Several studies showed that speakers produced more gestures while communicating spatial information (e.g., giving directions) (e.g., Alibali et al., 2001; Alibali, 2005; Allen, 2003; Beattie & Shovelton, 2002; Kita & Özyürek, 2003; Krauss, 1998; Rauscher et al., 1996; Trafton et al., 2006). The types of gestures used during communication also showed variations depending on the speech content. Speakers tend to produce more representational than nonrepresentational gestures in spatial contexts (Alibali et al., 2001; Alibali, 2005; Krauss, 1998).

However, when speaking about non-spatial (i.e., abstract) concepts, they tend to produce more metaphorical and beat gestures (Feyereisen & Havard, 1999; Zdrazilova et al., 2018). Given that gestures have been studied chiefly in spatial contexts (Alibali, 2005), we know little about gesture use in non-spatial contexts.

Moreover, gestures have various implications for speakers. Gestures alter speakers' thinking, suggesting that employing gestures not only affects concurrent speech to enhance communication but also influences speakers' later cognitive processes (for a review, see, Goldin-Meadow, 2010). For example, studies show that gesturing facilitates subsequent learning, problem-solving, and memory processes by enhancing information encoding (e.g., Alibali & Goldin-Meadow, 1993; Church & Goldin-Meadow, 1986; Levine et al., 2009; Goldin-Meadow & Beilock, 2010; Wakefield et al., 2018) primarily in spatial contexts (e.g., Chu & Kita, 2011; Galati et al., 2018; So et al., 2014; So et al., 2015). Thus, similar to the scant research on gesture use in non-spatial contexts, little is known about whether these implications of gestures are pertinent to non-spatial contexts.

Overall, we posit that studying gestures in a non-spatial context is essential since it might provide valuable insight into (1) how speakers use and benefit from gestures while conveying information about, for example, abstract concepts and (2) whether using gestures have similar later implications for speakers in non-spatial contexts (e.g., emotionality). Hence, the current study attempted to extend earlier research by examining bilinguals' gesture use in a non-spatial, emotional context to provide novel information on the role of gestures in diverse communicative contexts.

The relation between emotion, communication, and gesture

The close relation between emotion and communication has been studied by several researchers in different settings (Andersen & Guerrero, 1997; Fitness & Duffield, 2003; Lynch & Chernatony, 2004; Meijnders et al., 2001, Miller & Koesten, 2008). Emotions, which can be expressed only through communication (Waldron, 2012), affective states, and moods may influence people's communicative behaviors and strategies (Bless & Fiedler, 2006; Forgas, 1999, 2007; Keltner & Kring, 1998; Lord & Kanfer, 2002). Furthermore, emotions can be expressed through verbal (e.g., speech) and non-verbal means (e.g., facial expressions) and affect these communication channels. For instance, emotions may influence and be expressed through speech prosody (Frick, 1985; Scherer & Bänzinger, 2004), facial expressions, intonation, and posture (Ekman, 1993; Levenson, 1994). However, the number of studies focusing on nonverbal emotional communication is limited (Andersen & Guerrero, 1997), and a high portion of the existing studies focused on emotion expression through facial cues (e.g., for a review, see Reisenzein et al., 2013; Sauter et al., 2010). However, it is important to investigate the role of bodily movements in communicating emotions. Many brain-imaging studies have shown that emotions modulate action and motor-related brain areas, suggesting a close link between emotion and action (e.g., Kolesar et al., 2017; Kveraga et al., 2015; Meyer et al., 2019; Pichon et al., 2012; Portugal et al., 2020). Although some studies investigated emotion expression through body movements (e.g., Dael et al., 2013; Ditrrich et al., 1996; Sawada et al., 2003; Zieber et al., 2014), very few of them narrowed their focus on different types of hand gestures' role in emotion communication (e.g., Çatak et al., 2018; Guilbert et al., 2021). The current study focused on hand gestures, and their roles in expressing emotions. We remark that it is important to study gestures in emotional contexts as emotions are strongly linked with cognition (for a review, see Pessoa, 2008), and hand gestures are seen as windows to the mind and the brain (Goldin-Meadow, 1999; McNeill, 2013).

Additionally, one factor that affects people's communication strategies might be the valence of emotions. For example, studies demonstrated that negative mood facilitated effective communication and language understanding (Matovic et al., 2014). This finding might align with earlier research acknowledging negativity bias, which elucidates that people are drawn to, affected by, and tend to engage with negative instead of positive and neutral stimuli (Rozin & Royzman, 2001). Studies repeatedly showed the advantage of negativity not only in communication but also in various cognitive processes such as attention, memory, recognition, learning, decision-making, and information processing (e.g., Finkenauer & Vohs, 2001; Ito & Cacioppo, 2000; Öhman & Mineka, 2001; Rozin & Royzman, 2001; Smith et al., 2003). The explanation for the prevalence of negativity in different contexts lies primarily within the evolutionary theory. As negative stimuli threaten people's chances of survival, they attend to more negative than positive and neutral information to form responses to these threats and facilitate their survival (Öhman et al., 2001; Rozin & Royzman, 2001). Together, these findings suggest that negativity is prominent in communication and cognitive processes.

Given these, speakers may feel the need to express negative information more than its counterparts. Hence, due to this potential increased intent to express negativity, they may benefit from different communication channels while conveying negative information. Similar to how negativity is related to higher performance in cognitive processes, we propose that the same phenomenon may be observed in multimodal language processes, and speakers may benefit from using gestures more while conveying negative information.

The Present Study

This study examined multimodal language use in L1-Turkish and L2-English bilinguals' emotional narrative retellings. Specifically, we investigated whether, and if so how, (1) speaking

in the first (L1-Turkish) vs. second (L2-English) language and (2) the emotional valence of the narratives (i.e., negative vs. positive) were related to gesture production during retellings of narratives. We also examined whether and how speakers' gesture use during narrative retellings was associated with their subsequent subjective emotional intensity ratings of those narratives. To this end, we asked participants to retell positive and negative emotional narratives in their first and second languages and then rate the emotional intensity of the narratives they retold. We also measured participants' affective states with the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) and their age of acquisition for L2-English, given the importance of affective states on emotion communication and L2 age-of-acquisition in bilingual communication shown in earlier research (Dewaele & Pavlenko, 2002; Ferré et al., 2010; Forgas, 1999). We analyzed the frequency of representational and beat gesture use (i.e., number of gestures per 100 words) both during the entire narrative retelling and only during emotional speech (i.e., gestures that co-occur with emotional phrases).

First, we asked whether and how the language and the valence were related to gesture production. We expected people to produce more spontaneous co-speech gestures in L2 than in L1. The participants in the current study were sequential bilinguals who acquired L2-English later in life compared to L1-Turkish with weaker linguistic competence in L2. Thus, in line with earlier evidence (e.g., A.F., 2018; Aziz & Nicoladis, 2019; Drijvers & Özyürek, 2018; Gullberg, 1999; Laurent & Nicoladis, 2015; Nagpal et al., 2011; Nicoladis et al., 2007, 2009; Özer & Göksun, 2020; Smithson & Nicoladis, 2013; Zabihi, 2018), we predicted that gestures might provide an alternative channel of communication to compensate for L2-speakers' compromised linguistic proficiency and cognitive resources. In addition, we expected this effect to be observed only for representational gesture use (i.e., iconic, metaphoric, deictic gestures) (Nicoladis et al., 2007), but

not in non-representational gestures (i.e., beats) for both gestures during the entire retelling and concurrent with emotional speech. Moreover, we hypothesized that participants would use more gestures while retelling negative than positive emotional narratives because people have a proclivity to attend to and engage with negative information more than positive and neutral information (i.e., negativity bias, Rozin & Royzman, 2001). We predicted this negativity bias to be reflected in speakers' increased gesture use since it is observed in other cognitive processes such as increased recall and recognition of negative emotions (Huang & Luo, 2006; Norris, 2021). We also expected to observe these effects both for the gestures during the whole retelling and only during emotional phrases in speech.

Second, we asked whether and how gesture use was associated with participants' subjective emotional intensity ratings across the language and the valence. We expected participants to give higher subjective intensity ratings to narratives when they used more gestures during narrative retellings. Although we are not aware of any previous research directly examining this in an emotional context, earlier evidence showed that using gestures, like enactment, can alter thinking (see Goldin-Meadow & Beilock, 2010 for a review). Producing gestures enhances the encoding of information and might lead to more vivid and detailed remembering (e.g., Beilock & Goldin-Meadow, 2010; Cook et al., 2010; Goldin-Meadow et al., 2012; So et al., 2010; Stevanoni & Salmon, 2005). Related to this, we predicted that gesturing may lead to increased ratings of saliency for emotional narratives by enhancing information encoding. We also predicted this effect to be more prominent for negative emotional narratives (due to negativity bias) and when speaking in a language with lower communicative proficiency (i.e., in L2). We expected to observe these effects for both representational gestures during the whole retelling and only during emotional phrases in speech.

Method

Participants

In line with earlier research (e.g., Nagpal et al., 2011; Nicoladis et al., 2007; Smithson & Nicoladis, 2013), our sample consisted of 22 native Turkish-speaking participants (18 females, M_{age} = 24, SD_{age} = 5.73). All participants acquired English (L2) later in life, ranging from the ages of 3 to 12 (M_{age} = 8.86, SD = 2.49). We recruited our participants through Koç University's subject pool (N = 5) and convenience sampling (N = 17). Participants were compensated with either course credit or an Amazon voucher worth 50 Turkish Liras (approximately 4 dollars) for their participation. All participants had a normal or corrected-to-normal vision. The experiment was approved by Koç University Ethical Committee on Human Research.

Materials and Measures

Emotional Narratives

We collected 30 emotion-laden vignettes from novels, theatre scripts, and movies in Turkish and English. We edited these narratives so that they were all in the same length and written from the first-person point of view. Then, we sent out the Turkish versions of these narratives for emotional intensity rating. Twenty-one native Turkish-speaking participants rated these narratives for emotional intensity based on three questions. First, they determined the emotional valence in the narrative (i.e., positive or negative). Second, they chose what they thought was the prominent emotion(s) in the narrative. They could select up to three out of 10 emotions (i.e., disgust, anger, happiness, sadness, fear, surprise, courage/pride, joy, hatred, anxiety). If they thought there was another emotion in the narrative that was not among these 10, they could specify so. Third, they rated how intense they thought the prominent emotions were on a scale ranging from one (not intense at all) to seven (very intense).

After collecting the intensity ratings of the Turkish narratives, we picked 14 narratives that were rated as the most intense. We selected these 14 narratives based on the cutoff point that we decided would highly indicate emotional intensity (i.e., five out of seven). All narratives we chose had an emotional intensity rating above five except for one whose rating was 4.91, which we agreed on including among the 14 because its rating was quite close to our cutoff point. We then acquired the original English versions for 13 of them, and one of them was translated in a translation and back-translation format. We asked a different sample of 26 participants to rate these 14 narratives for emotional intensity. The sample consisted of nine native English speakers ($N_{British}$ = 5, $N_{American}$ = 3, $N_{Australian}$ = 1) and 17 English-as-a-second-language speakers ($N_{Turkish}$ = 13, N_{German} = 2, N_{Indian} = 1, $N_{Russian}$ = 1). After they rated the English narratives' emotional intensity, we picked eight narratives that were rated as the most intense ($M_{intensity}$ = 5.90, SD = 0.42). Based on these pilot studies, we selected four positive ($M_{intensity}$ = 5.77, SD = 0.32) and four negative narratives ($M_{intensity}$ = 6.04, SD = 0.33) (The English and Turkish versions of the narratives are presented in Appendix A).

Positive and Negative Affect Schedule (PANAS)

To measure participants' affective states when they took part in this study, we used the Turkish adapted version of the Positive and Negative Affect Schedule (Gençöz, 2000) initially developed by Watson and colleagues (1988). This self-report questionnaire assesses participants' current affective state with 20 items (i.e., 10 for positive affect and 10 for negative affect). Each item is evaluated on a 5-point Likert scale from one (Very Slightly or Not at All) to five (Extremely) based on the degree to which an item reflects what a responder is feeling at that time. Higher Positive Affect scores reflect being joyful, attentive, vigilant, and energetic. On the other hand, higher Negative Affect scores reflect being distressed, sad, or having feelings of displeasure.

Procedure

This two-step study was conducted online on Zoom. In the first step, participants joined a Zoom session in which only the participant and the experimenter were present. Once participants joined the Zoom session, they filled out the online informed consent form. Next, participants were asked to sit 1-1.5 meters away from the devices they used to join the experiment for us to see their hand movements clearly for later coding. Participants received detailed and standardized instructions on the experimental procedure.

We prepared two narrative blocks consisting of short emotional narratives. There were four English and four Turkish narratives in each block: two positive and two negative narratives for each language (see Appendix A). Participants were randomly assigned to one of these narrative blocks. To prevent any order effect that might occur due to the language and the emotional valence, we randomized and counterbalanced the way participants viewed the narratives. A participant did not see both the English and the Turkish versions of a narrative. For instance, if one narrative was presented in English in one block, its Turkish version was in the other block and vice-versa to prevent any narrative-based practice effect. Following the warm-up questions, participants started reading the short emotional narratives. For example, one negatively valenced emotional narrative participants read was: "*Through an underwater veil, I feel hands on my arms pull me away from him. Medics bend down over his body. His eyes are closed now, and I can't see him breathing. When the medics try again to pull me from him. I shove them roughly away and scream*." One positively emotional narrative participants read was: *"We were walking side by side on the beach and just looking at each other and smiling. We were running alone in our coats on the beaches which only the wind wandered around and the waves licked. And we were kissing each other's blushing cheeks."*

Participants were not told the main purpose of the study at any stage of the experiment to prevent any bias that might occur during the experiment. Participants were merely instructed to read each narrative for 30 seconds, after which they were asked to retell what they had just read. The written instruction they saw on their screen after reading each narrative was, "Please retell in detail what you remember from the text you have just read." Each participant was given 30 seconds to finish reading the narratives to control for the study time across participants. The narratives were not present on the screen when participants started to retell them. Participants did not receive any explicit instruction on gesture use or feedback regarding their answers. Both the experimenter and the participant kept their cameras on during this step of the experiment, which was recorded for later speech and gesture coding. In the second step, participants received a Qualtrics link to answer demographic questions, their age of acquisition for L2-English, and complete the PANAS. Later, participants rated the emotional intensity of the narratives with three questions that were identical to the ones used in the pilot study for intensity ratings. Last, they were thanked for their participation and were notified that their responses had been recorded. The entire procedure lasted 25-30 minutes.

Transcription and Coding

Speech

Participants' speech was transcribed verbatim for each narrative. We transcribed speech to measure (1) the total number of words uttered in each narrative to calculate the gesture rate per word, and (2) the rate of gestures that specifically co-occurred with emotional phrases in speech. We defined emotional phrases as to include (1) emotional words (e.g., *"happy," "sad," "angry"*), and (2) manifestation of emotion (i.e., non-emotional words that evoke emotionality, e.g., "*crying," "laughing").*

Gesture

We coded spontaneous co-speech gestures produced by participants during retellings. We coded four different types of gestures: (1) iconic gestures, (2) deictic gestures, (3) metaphoric gestures, and (4) beat gestures (McNeill, 1992). We did not include emblems as participants produced very few of them during their speeches. Additionally, we coded participants' gestures and measured the frequency of gesture use both during the entire retelling and during emotional phrases only. We normalized the number of gestures produced to the number of words uttered during narrative retellings. That is, we measured the number of gestures per 100 words for each narrative. We calculated the number of iconic, deictic, metaphoric, and beat gestures per 100 words produced both during the entire retelling and during emotional speech only. We also calculated the overall representational gesture use for each instance by summing iconic, deictic, and metaphoric gestures. Two independent coders coded the co-speech gestures. The first author coded all the gestures. A trained research assistant coded 20% of the gestures to test reliability. Intraclass correlation coefficients (ICC) for interrater reliability was excellent for overall gesture use (ICC = 0.91, 95% CI [0.66, 0.97], $p < .001$), good for representational gesture use (ICC = 0.85, 95% CI [0.47, 0.97], $p < .001$), and excellent for gesture use concurrent with emotional phrases (ICC = 0.98, 95% CI [0.77, 0.99], $p = .005$). Any discrepancy regarding the coding was resolved by the first author.

Results

Preliminary Analyses

Participants produced at least one gesture in 84.1% of the narratives. Table 1 presents the total number of different types of gestures produced across Turkish vs. English and positive vs. negative emotional narratives.

Table 1. Total number of different gesture types used while retelling emotional narratives

Language	Valence	Gesture Type				
		Iconic	Deictic	Metaphoric	Beat	Overall
Turkish	Positive	20	9	51	90	170
	Negative	42	18	51	81	192
English	Positive	49	38	45	128	260
	Negative	46	39	63	118	266
Overall		157	104	210	417	888

Table 2 presents the total number of gestures that co-occur with emotional words and emotional manifestation in speech across Turkish vs. English and positive vs. negative emotional narratives.

Table 2. Total number of gestures produced during emotional phrases

Language	Valence			
		Emotional Word Use	Manifestation of Emotion	Overall
Turkish	Positive	27	19	46
	Negative	20	61	81
English	Positive	18	28	46
	Negative	20	42	62
Overall		85	150	235

To see if the order of the language in which participants viewed the narratives (i.e., Turkish first-English second, and vice-versa) affected gesture frequency, we conducted a 2x2x2 mixed design ANOVA with the order of the language order as the between-subjects factor, and the language and valence as within-subjects factors. The results showed that the order of the language did not affect total gesture frequency, F (1,20) = 0.48, p = .49. There were also no two-way interactions between the language order and language, F (1,20) = 0.99, p = .33, the language order and valence, F (1,20) = 0.55, p = .465, and three-way interactions among them, F (1,20) = 0.2, p = .89. We conducted the same analysis to see whether the language order affected participants' subjective emotional intensity ratings of the narratives. The results revealed no significant effect of the language order on emotional intensity ratings, F (1,20) = 0.50, p = .48. There were again no

two-way interactions between the language order and language, F (1,20) = 0.54, p = .47, the language order and valence, F (1,20) = 3.77, p = .06, and three-way interactions among them, F (1,20) = 0.11 p = .74. Thus, we did not consider language order in further analyses.

Main Analyses

We had two sets of analyses. In Set-1, we asked whether and how the language (L1-Turkish vs. L2-English) and the valence of the narratives (positive vs. negative) were related to participants' gesture use after controlling for their mood (i.e., positive, and negative mood scores of PANAS) and the age of acquisition for L2-English. For this, we conducted nine separate linear mixed-effects models with different outcome variables as the index of gesture production: (1) Model 1: total representational gesture use (i.e., the sum of iconic, deictic, and metaphoric gestures) during the entire retelling, (2) Model 2: iconic gesture use during the entire retelling, (3) Model 3: deictic gesture use during the entire retelling, (4) Model 4: metaphoric gesture use during the entire retelling, (4) Model 4: non-representational (i.e., beat) gesture use during the entire retelling, (6) Model 6: total representational gesture use during emotional content, (7) Model 7: iconic gesture use during emotional content, (8) Model 8: metaphoric gesture use during emotional content, and (9) Model 9: beat gesture use during emotional content. We did not report analyses with deictic gesture use during emotional speech as the outcome variable since the model did not converge possibly due to limited number of this type of gestures in the dataset. In all of these models, the fixed effects included the language, the valence, and the two-way interaction between the language and valence. We entered the age of acquisition for L2-English, and negative and positive mood scores of PANAS as control variables.

In Set-2, we asked whether and how using gestures when retelling a narrative was related to participants' emotional intensity rating of those narratives across the language and the valence

after controlling for their mood. For this, we conducted ten separate linear mixed-effects models with emotional intensity ratings as the outcome variable and different indexes of gesture production as the fixed effects across different models: (10) Model 10: total representational gesture use during the entire retelling, (11) Model 11: iconic gesture use during the entire retelling, (12) Model 12: deictic gesture use during the entire retelling, (13) Model 13: metaphoric gesture use during the entire retelling, (14) Model 14: non-representational (i.e., beat) gesture use during the entire retelling, (15) Model 15: total representational gesture use during emotional content, (16) Model 16: iconic gesture use during emotional content, (17) Model 17: deictic gesture use during emotional content, (18) Model 18: metaphoric gesture use during emotional content, and (19) Model 19: beat gesture use during emotional content. The other fixed effects in these models included the language, the valence, and all the two- and three-way interactions among gesture frequency, the language, and the valence. The negative and positive mood scores of PANAS were entered as control variables. In all models, we started by adding both random subject- and item-intercepts. However, due to singular fit convergence issues we faced in Models 5, 6 and 8; we simplified the random effects structures by discarding random item-intercepts in these models.

We performed all analyses with *lme4* package (Bates et al., 2015) on R Studio (R Studio Team, 2020). All continuous predictor variables were standardized (i.e., scaled). We set the contrast coding of all categorical variables to sum-to-zero (i.e., deviation coding), which means that the intercept corresponded to the grand mean, and each contrast encoded the deviation of the mean of a given level from the intercept (i.e., grand mean) for a given factor. We reported Bonferroni-adjusted pairwise comparisons to probe differences across levels of categorical fixed terms and simple slope estimates for interactions with continuous predictors. Here, we report only significant main effects and interactions. The datasets analyzed in the study and the R code are

available in the Open Science Framework repository (https://osf.io/cb6dp/?view_only=8e0634ce22a2434787c94f7b7a9b688c). Model summaries with parameter estimates can be found in Table 3 (Models 1 – 9) and Table 4 (Models 10 – 19).

Table 3. Model summaries for Set-1 analyses.

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**		**Model 7**		**Model 8**		**Model 9**	
	β	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*
FIXED EFFECTS																		
Intercept	7.11***	.90	2.35***	.53	1.56***	.29	3.20***	.58	6.12***	.73	2.92***	.41	.49**	.15	2.35***	.42	.69**	.18
Language (= Turkish)	-1.21**	.37	-.31	.22	-.83***	.15	-.07	.26	-.75	.40	.55*	.25	.14	.10	.38	.23	.03	.10
Valence (= positive)	-.62	.42	-.18	.41	-.19	.17	-.24	.35	.65	.40	-.59*	.25	-.19	.15	-.35	.23	-.11	.12
Language * Valence	-.12	.37	-.15	.22	-.09	.15	.14	.26	.12	.40	-.03	.25	-.15	.10	.15	.23	-.23*	.10
PANAS Negative	-.57	.90	.02	.43	-.06	.29	-.42	.55	-.50	.75	-.31	.42	.04	.11	-.34	.43	.17	.18
PANAS Positive	-.77	.93	-.59	.43	-.26	.30	.06	.56	-1.01	.77	-.09	.44	-.13	.11	.02	.44	.01	.18
AoA for L2	.43	.93	.10	.43	.32	.30	.07	.57	-.17	.77	-.16	.44	-.15	.11	-.01	.44	.02	.19
	Var	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*
RANDOM EFFECTS																		
Subject-Intercept	13.89	3.73	2.60	1.61	1.24	1.11	4.73	2.17	8.25	2.87	2.37	1.54	.01	.11	2.67	1.64	.44	.66
Item-Intercept	.62	.79	1.92	1.39	.08	.29	.84	.91	-	-	-	-	.19	.44	-	-	.05	.23
Residuals	24.12	4.91	8.13	2.86	4.03	2.01	11.92	3.45	27.78	5.27	10.75	3.28	1.78	1.33	9.58	3.10	1.84	1.36

Notes: AoA for L2: Age of acquisition for L2-English; SE: Standard error; Var: Variance; SD: Standard deviation
Significance codes: *** p<.001; **p<.01; *p<.05

Table 4. Model summaries for Set-2 analyses.

	Model 10		**Model 11**		**Model 12**		**Model 13**		**Model 14**		**Model 15**		**Model 16**		**Model 17**		**Model 18**		**Model 19**	
	β	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*
FIXED EFFECTS																				
Intercept	5.88***	.13	5.89***	.14	5.88***	.15	5.89***	.14	5.89***	.14	5.95***	.14	5.92**	.15	5.92***	.15	5.93***	.14	5.89***	.15
‡Gesture	.27**	.10	.06	.10	-.01	.14	.37***	.09	.22*	.10	.32**	.11	.04	.12	.02	.14	.34**	.11	.18	.10
Language (= Turkish)	.14	.09	.09	.09	.10	.10	.10	.08	.12	.09	.03	.09	.09	.09	.12	.09	.05	.09	.08	.09
Valence (= positive)	.10	.13	.08	.13	.09	.13	.11	.13	.06	.12	.14	.13	.09	.13	.08	.13	.13	.13	.08	.13
Gesture *Language	-.12	.10	-.04	.09	-.09	.14	-.16	.09	-.11	.10	-.25*	.11	-.12	.11	.03	.14	-.18	.11	-.08	.09
Gesture * Valence	.01	.10	.00	.09	.11	.13	.03	.09	.00	.10	.07	.10	.11	.12	.13	.14	.04	.11	-.01	.10
Language * Valence	.07	.09	.08	.09	.11	.10	.06	.08	.09	.09	.03	.09	.06	.09	.08	.09	.04	.09	.10	.09
Gesture*Lang*Val	-.02	.10	-.08	.10	.03	.13	.00	.09	.01	.10	-.09	.11	-.09	.11	.14	.15	-.10	.11	-.07	.09
PANAS Negative	.24*	.10	.21	.11	.21	.12	.26*	.10	.23	.11	.23*	.11	.20	.12	.21	.12	.24*	.11	.19	.12
PANAS Positive	-.09	.10	-.11	.11	-.13	.12	-.13	.10	-.09	.11	-.13	.11	-.12	.11	-.13	.11	-.14	.10	-.13	.11
	Var	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*	*Var*	*SD*		
RANDOM EFFECTS																				
Subject-Intercept	.04	.21	.08	.29	.12	.35	.05	.23	.08	.29	.07	.27	.11	.32	.11	.33	.07	.26	.12	.34
Item-Intercept	.13	.36	.14	.37	.13	.36	.17	.41	.12	.35	.13	.36	.14	.37	.14	.37	.14	.38	.17	.41
Residuals	1.29	1.14	1.33	1.15	1.31	1.14	1.21	1.10	1.29	1.13	1.27	1.13	1.31	1.14	1.29	1.14	1.26	1.12	1.27	1.12

Notes: ‡*Gesture* denotes different indexes of gesture frequency across different models, please see Analysis section for this. SE: Standard error; Var: Variance; SD: standard deviation
Significance codes: *** p<.001; **p<.01; * p<.05.

Set-1: How did gesture production change across language and valence?

Model 1 revealed a significant main effect of language on total representational gesture use during the entire retelling, after controlling for PANAS positive and negative mood scores and the age of acquisition for L2-English ((β = -1.21, *SE* = 0.37, *t* = -3.25, *p* = .001). Participants used more representational gestures when speaking in L2-English than in L1-Turkish by 2.41 ± 0.75 (*t* (142) =3.22, *p* = .001). Figure 1 displays representational gesture use during the entire retelling across language and valence. Then, we inspected the effect observed in the representational gesture use more closely by conducting separate analyses for iconic (Model 2), deictic (Model 3), and metaphoric (Model 4) gesture use during the entire retelling. In Model 2, we did not find any effects of language and valence on iconic gesture use (all *p*s > .05). Model 3 showed a significant main effect of language on deictic gesture use during the entire retelling (β = -0.83, *SE* = 0.15, *t* = -5.44, *p* < .001). Participants used more deictic gestures when speaking in their L2-English compared to L1-Turkish by 1.65 ± 0.31 (*t* (142) =5.40, *p* < .001). In Model 4, we did not find any effects of language and valence on metaphoric gesture use (all *p*s > .05). Model 5 revealed no significant effects of language and valence on non-representational (i.e., beat) gesture use during the entire retelling (all *p*s > .05).

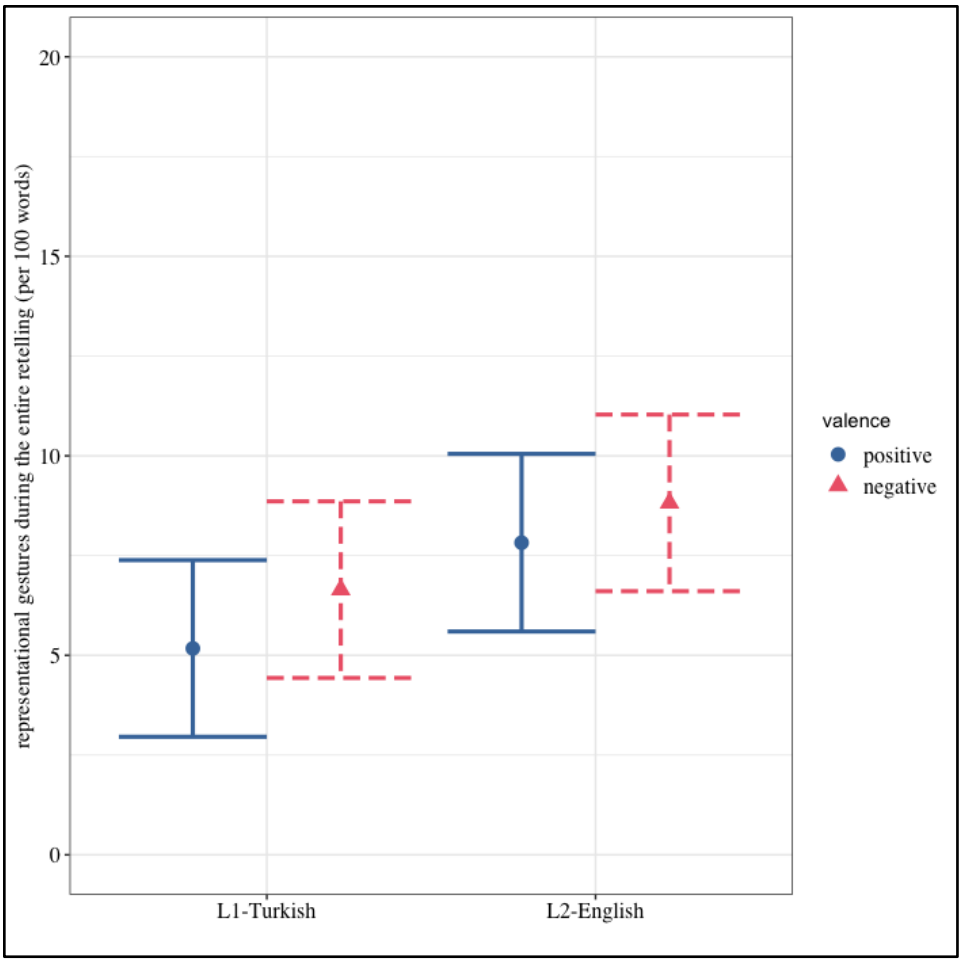

Figure 1. The percentage of representational gestures (i.e., the sum of iconic, deictic, and metaphoric gestures) produced during the entire retellings across L1-Turkish vs. L2-English and positive vs. negative narratives.

Through Models 6 to 9, we analyzed gesture use during emotional content. Model 6 revealed significant main effects of language (β = 0.55, *SE* = 0.25, *t* = 2.23, *p* = .03) and valence (β = -0.59, *SE* = 0.25, *t* = -2.37, *p* = .02) on representational gesture use during emotional content. Participants used more representational gestures during emotional content when speaking in their L1-Turkish compared to L2-English by 1.10 ± 0.50 (*t* (156) =2.20, *p* = .03), and when retelling negative narratives compared to positive ones by 1.18 ± 0.50 (*t* (156) =2.35, *p* = .02). However, when iconic (Model 7) and metaphoric (Model 8) gesture use during emotional content were

analyzed separately, there were no significant effects of language and valence (all *p*s > .05). Model 9 revealed a significant interaction between language and valence on non-representational (i.e., beat) gesture use during emotional content (β = -0.23, *SE* = 0.10, *t* = -2.24, *p* = .03). Participants used more beat gestures when retelling negative compared to positive narratives only in their L1-Turkish by 0.68 ± 0.32 (*t* (45.5) =2.12, *p* = .04.

In sum, Set-1 analyses showed that participants used more representational gestures when speaking in L2-English than in L1-Turkish during the entire retelling, and this mainly stems from deictic gesture use. Yet, when we analyzed gesture use during emotional content, participants used more representational gestures in L1-Turkish than L2-English and when retelling negative than positive narratives. However, when different gesture types were analyzed separately, we did not find the same effect possibly due to limited number of gestures in each category of representational gestures during emotional speech. Last, participants used more beat gestures during emotional speech when retelling negative narratives than positive ones only in their L1-Turkish, but not in L2-English.

Set-2: How was gesture production associated with participants' subjective emotional intensity ratings for narratives across language and valence?

Model 10 revealed a significant main effect of the frequency of representational gesture use during the entire retelling on participants' subjective emotional intensity ratings (β = 0.27, *SE* = 0.10, *t* = 2.74, *p* = .01). Participants rated narratives as being more emotionally intense as they used more representational gestures when they retold those narratives. We also found a significant main effect of PANAS negative scores (β = 0.24, *SE* = 0.10, *t* = 2.32, *p* = .03). Participants with more negative affect rated narratives as being more emotionally salient. Then, we inspected this effect more closely by examining iconic (Model 11), deictic (Model 12), and metaphoric (Model

13) gestures separately. There were no significant effects of iconic or deictic gesture use on emotional intensity ratings (all *p*s > .05). Yet, Model 13 showed that metaphoric gesture use during the entire retelling was associated with increased emotional intensity ratings (β = 0.37, *SE* = 0.09, *t* = 3.94, *p* < .001). We also observed the same effect for the use of non-representational (i.e., beat gestures, Model 14). Participants' beat gesture use during the entire retelling was associated with increased emotional intensity ratings (β = 0.22, *SE* = 0.10, *t* = 2.15, *p* < .03).

Then, we analyzed how gesture use during emotional content was associated with subsequent emotional intensity ratings. In Model 15, we found a significant interaction between representational gesture use during emotional speech and the language on emotional intensity ratings (β = -0.25, *SE* = 0.11, *t* = -2.26, *p* = .03). Follow-up simple slopes analyses revealed that the use of representational gestures during emotional speech was associated with higher subjective emotional intensity ratings of narratives, only when participants retold those narratives in L2-English (β = 0.56, *SE* = 0.18, *t* = 3.13, *p* < .001). Figure 2 displays the relationship between representational gesture use during emotional speech and emotional saliency ratings across the languages and the emotional valences, after controlled for mood scores. Also, PANAS negative mood scores were associated with increased ratings (β = 0.23, *SE* = 0.11, *t* = 2.13, *p* = .04). However, when each representational gesture category was analyzed separately, we did not the find the same set of results. Also, there was no effect of beat gesture use during emotional speech on emotional intensity ratings (all *p*s > .05).

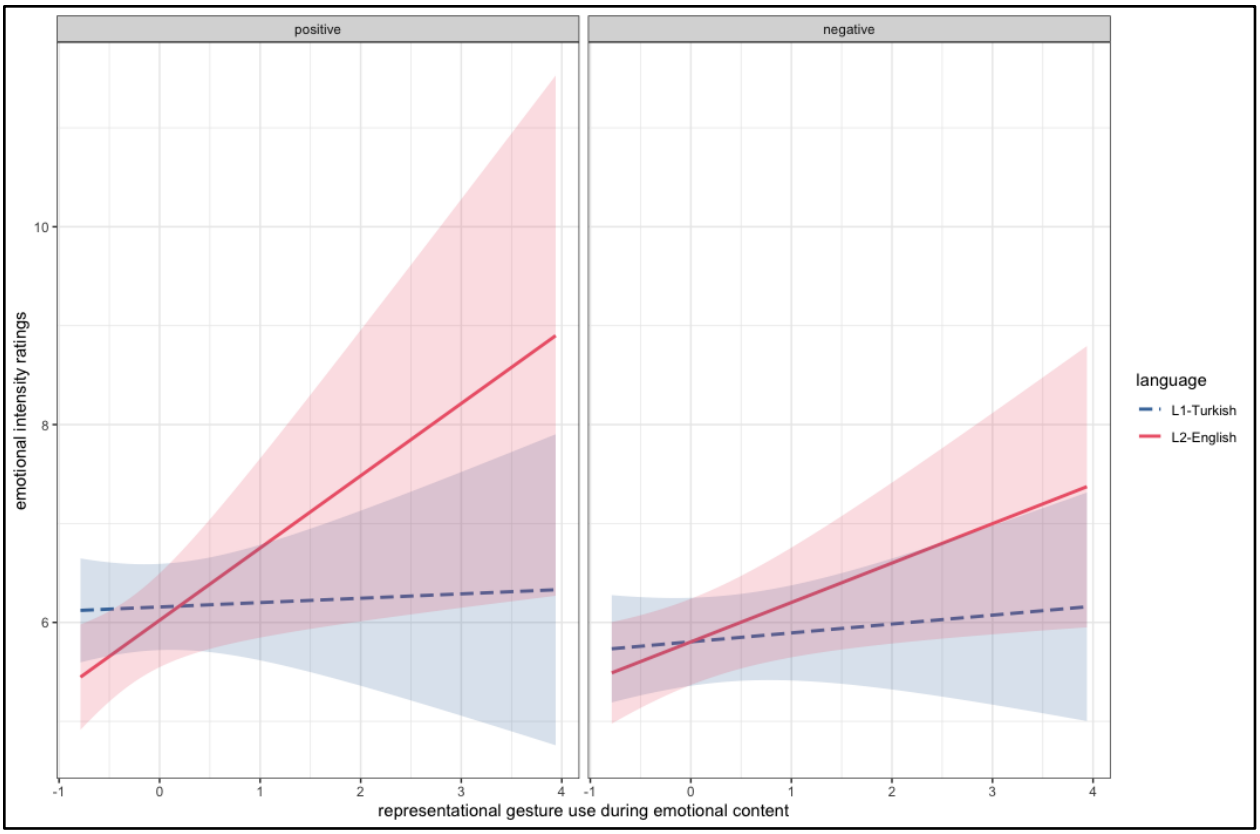

Figure 2. The relationship between representational gesture use during emotional phrases and emotional intensity ratings across L1-Turkish vs. L2-English and positive vs. negative emotional narratives. Please note that although participants rated narratives' emotional intensity on 1-7 Likert scale, the y-axis in this figure represents model estimated predictive scores. The x-axis displays the scaled and centered scores for the number of representational gesture use. The hues around the lines represent 95% confidence intervals.

In sum, Set-2 analyses demonstrated that the use of metaphoric and beat gestures during the entire narratives was associated with increased emotional intensity ratings subsequently. When gestures that were produced during emotional content were analyzed, we found that the overall use of representational gestures during emotional speech was associated with increased subjective emotional intensity ratings only when speaking in L2-English, but not in L1-Turkish. Last, we showed that participants with more negative mood rated narratives as more emotionally salient.

Discussion

This study investigated bilinguals' spontaneous co-speech gesture use in L1-Turkish and L2-English during emotional narrative retellings. We asked whether, and if so how, (1) communicating in L1 vs. L2, and (2) the emotional valence of the narratives was related to gesture production while retelling the narratives. We also asked (3) whether gesture production during retellings was associated with participants' subsequent emotional intensity ratings of the narratives. We hypothesized that participants would produce more representational gestures, while speaking in L2 than in L1, and during negatively than positively valenced narratives. Further, we expected speakers who produced gestures more frequently during narrative retellings to rate those narratives as more emotionally intense. Our results demonstrated that speakers produced (1) a higher number of representational gestures during the entire retelling in L2 than in L1, which stemmed from the use of deictic gestures, (2) more representational gestures during emotional content in L1 than in L2, (3) more representational gestures that co-occurred with emotional speech while retelling negative than positive emotional narratives and beat gestures co-occurring with emotional speech in negative narratives in L1, and (4) using more representational gestures during retellings was positively associated with subsequent ratings of narratives' emotional intensity. Overall, our study provides insights into the mechanisms and the functions of gesture production across L1 vs. L2 in a non-spatial (i.e., emotional) context. To our knowledge, the current study is among the first to examine bilinguals' gesture use in an emotional context. Not only do we support earlier evidence in the gesture literature, but we also extend these findings to different communication contexts.

First, we demonstrated that participants produced representational gestures more frequently during the entire emotional narrative retellings in L2 than L1. This result aligns nicely

with earlier evidence suggesting that bilinguals produce more gestures while speaking in L2 than L1 (e.g., Gullberg, 1999; Nicoladis et al., 2007; Nagpal et al., 2011). One reason for this difference between languages may be bilinguals' relatively lower linguistic proficiency in L2 than L1 (Marcos, 1979, Nicoladis et al., 2007; Smithson & Nicoladis, 2013). Thus, when bilinguals cannot fully express themselves through their speech in their non-dominant language due to linguistic constraints, they might benefit from using gestures to convey information. There may be a trade-off between the speech and gesture modalities in communication (de Ruiter et al., 2012). In other words, when spoken communication is compromised, speakers might benefit from using gestures as an alternative channel of expression to compensate for reduced linguistic proficiency, as in the case of communicating in L2 (Özer & Göksun, 2020). This is also in line with our finding that participants produced more representational gestures while retelling emotional narratives in L2 than L1, which was mainly driven by deictic gesture use.

In our study, there were no concrete objects participants could point to while retelling the emotional narratives. Thus, the deictic gestures are abstract deictics that refer to abstract entities such as abstract referents (e.g., locations of characters) in the narratives (McNeill et al., 1993). One reason why our participants produced more abstract deictics in L2 may be related to their reduced linguistic proficiency in L2. Studies showed that when linguistic proficiency and capacity decrease, speakers start to use more deictic gestures while communicating (e.g., Arslan & Göksun, 2021). For example, as older individuals' linguistic capacity decreases as they age (Burke et al., 1991), they use more deictic gestures than younger adults whose linguistic abilities were relatively intact (Arslan & Göksun, 2021). Therefore, because our participants were not as linguistically proficient in L2 compared to L1, they might have used deictic gestures more to compensate for their reduced L2 proficiency. Additionally, bilinguals benefit from using deictic gestures in L2

while retelling narratives (Gullberg, 1998) and use abstract deictics in narrative retelling tasks to reduce their cognitive load (e.g., Azar et al., 2020; Gullberg, 2013; Nicoladis, 2007). Thus, this indicates that bilinguals might benefit from using abstract deictics more while communicating emotions to compensate for their compromised linguistic abilities or reduce their cognitive load. However, there was no difference in using beat gestures across L1 and L2 in overall retelling. This suggests that bilinguals' use of representational gestures, mainly deictic gestures, might play a more prominent role than beat gestures in enhancing communication as they carry semantic information particularly for challenging communication situations, such as speaking in a non-dominant language.

Another possibility of speakers using more gestures in L2 than in L1 might be related to the increased cognitive load associated with speaking in L2. Communicating in L2 is cognitively more challenging and demanding compared to L1 (Nawal, 2018; Schoonen et al., 2003; Sweller et al., 2011; Weigle, 2005; Zabihi, 2018; Zimmerman, 2000). Thus, gesturing may decrease speakers' cognitive load by offloading the internal cognitive burden and freeing up the cognitive resources required for effective spoken communication (e.g., Cook et al., 2012; Goldin-Meadow et al., 2001; Marstaller & Burianova, 2013; Melinger & Kita, 2007; Wagner et al., 2004; Ping & Goldin-Meadow, 2010; Pouw et al., 2014; Pouw et al., 2016). Gesturing might also help grounding abstract concepts to the concrete domain by activating visual, spatial, and motoric representations, particularly for abstract contexts and for individuals with lower verbal resources to express abstractness (Beaudoin-Ryan & Goldin-Meadow, 2014; Kita et al., 2017). Indeed, in the current study, participants produced representational gestures that ground abstract notions to a more concrete domain. For example, a participant brought her hands together as if she was outlining a particular emotion (e.g., happiness). Therefore, our participants might have employed more

representational gestures that enabled communicating abstractness, particularly in their non-dominant language where they have difficulty in expressing abstract notions.

Contrary to what we have found when overall gesture use during the entire retelling was analyzed, our results demonstrated a different pattern for gestures that are specifically used along with emotional speech: participants used more representational gestures that co-occurred with emotional content in L1 than in L2. One explanation might be the relatively weaker links between lexical items and abstract concepts and reduced conceptual links in L2 than in L1 (Altın et al., in press; de Groot, 1992; Kroll & Stewart, 1994; Pavlenko, 2009; Potter et al., 1984; van Hell & de Groot, 1998). Therefore, since emotional concepts are more strongly consolidated in L1, our participants might have used more representational gestures concurrent with emotional content to express emotions in L1 than in L2 during their speech. This indicates that bilinguals might produce more representational gestures accompanying their emotional speech in L1 than in L2, potentially associated with the difference between the strength of semantic links of emotional concepts in L1 and L2.

Third, our results revealed that participants produced representational gestures concurrent with emotional phrases more frequently while retelling negative compared to positive emotional narratives regardless of the language. This finding aligns with the negativity bias (Rozin & Royzman, 2001). Studies consistently demonstrated the advantage of negative stimuli in different cognitive processes such as recognition, attention, and memory (e.g., Baumeister et al., 2001; Finkenauer & Vohs, 2001). Our results corroborate and extend these findings by providing evidence for the saliency of negativity in the multimodal expression of emotions. Since negative stimuli require higher cognitive processing, cognitive representations of negative information are more complex (Ducette & Soucar, 1974; Fiske, 1980; Peeters & Czapinksi, 1990). Thus, one

explanation for why participants produced more representational gestures concurrent with negative emotional phrases may be to facilitate expressing emotional information by reducing their cognitive load when their cognitive resources are taxed more by negative than positive emotional phrases. However, our findings are in line with the negativity bias only to some extent because we did not find the effect of emotional valence on gesture production during the entire retellings of narratives. Namely, participants did not simply employ more representational gestures while retelling negative emotional narratives. Instead, they produced more representational gestures concurrent only with negative emotional phrases. This finding indicates that negativity might play a vital role in representational gesture production while especially communicating emotional information.

Furthermore, our results also showed that participants produced more beat gestures concurrent with emotional phrases while retelling negative emotional narratives in L1 than in L2. Since bilinguals are emotionally more aroused in their L1 than in L2 (Ayçiçeği & Harris, 2004; Pavlenko, 1998) and the aforementioned advantage of negative stimuli in communication (Rozin & Royzman, 2001), our participants might have felt the need to emphasize negative emotional phrases in L1 more during communication. Because beat gestures accentuate important parts of speech (McNeill, 1986; McNeill & Levy, 1982), our participants may have employed more beat gestures to highlight negative emotional phrases in L1. This suggests that bilinguals' beat gestures may play an important role in emphasizing negative emotional information in their first language.

Last, our findings showed that participants who produced more representational, driven by metaphoric gesture use, during retellings later rated those narratives as more emotionally intense, indicating a positive association between gesture production during the retellings and subsequent emotional intensity ratings, regardless of the language. One explanation for this phenomenon may

be gestures' enhancing effect in information encoding. Studies demonstrated that acting out, particularly gesturing, while encoding information positively affects subsequent memory performance for the same information (e.g., Cook et al., 2010; Stevanoni & Salmon, 2005). This suggests that gesturing, like enactment, might enhance information encoding and lead to thorough recall (Beilock & Goldin-Meadow, 2010; Cook et al., 2010; Goldin-Meadow et al., 2012). Although the participants' subsequent task in our study (i.e., emotional intensity rating) differs from those performed in the abovementioned studies (i.e., recall performance), the same facilitating role of gestures during information encoding may have increased participants' subjective emotional saliency ratings of the narratives. In addition, the reason why metaphoric gesture production leads to increased emotional intensity ratings may be because of metaphoric gestures' close relation to emotions in our study. That is, participants' metaphoric gestures during the retellings referred to certain emotions (e.g., satisfaction, happiness, sadness) in the current study. Metaphoric gesture production may have played an important role in enhancing particularly emotional information due to its close relation to abstract content, leading to increased subjective emotional intensity. Therefore, we propose that both metaphoric gesture and beat gesture production may intensify the perception of emotions by enhancing the information encoding process, regardless of the language.

However, we found a different pattern when we only analyzed gestures that co-occur with the emotional speech. Participants who produced more co-emotional phrase gestures during retellings subsequently rated these narratives as more emotionally intense, only in L2 but not in L1. One explanation for the facilitative effects of gesturing on perceived emotional saliency might stem from weaker links between lexical items and concepts in L2 lexicon (de Groot, 1992), particularly for abstract words (Kroll & Stewart, 1994; van Hell & de Groot, 1998). Studies in the

field of bilingual lexicon demonstrated that abstract lexical items share fewer semantic links across L1 and L2 and reduced conceptual links between the lexical item and the concept in L2 than in L1 (Altın et al., in press; Pavlenko, 2009; Potter et al., 1984). These reduced semantic links observed in L2 compared to L1, particularly for abstract concepts, might be the reason behind facilitative effects of gesturing on perceived emotional intensity in L2. Using gestures might facilitate subsequent emotional representations in L2 as there is more room for enhancement for L2. In particular, the higher rates of gesture use concurrent with emotional phrases in L2, which might be particularly useful for boosting the weaker emotional semantic links through information encoding, might have intensified the perception of emotional information; thus, increasing participants' subsequent emotional intensity ratings. Together, these suggest that in a non-dominant language, where emotional semantic links are weaker and not as firmly consolidated than in a dominant language, co-emotional speech gesture use may bolster these semantic links more by enhancing information encoding. This finding also aligns with our abovementioned finding that bilinguals used more co-emotional speech representational gestures in L1 than in L2, possibly due to enriched emotional representations in L1. However, our findings demonstrate that bilinguals benefit from using representational gestures concurrent with emotional content in L2, where emotional conceptual links are reduced, which might boost the weaker conceptual links through information encoding because there is more room for enhancement in L2, leading to intensified emotion perception. Hence, these together indicate that bilinguals might benefit from using representational gestures concurrent with emotional content both in their L1 and L2.

One novelty of the current study is the examination of gesture use in a non-spatial context, which is different from earlier evidence that focused on the relation between gesture production and spatiality (but see, Hurtienne et al., 2010; Parrill & Stec, 2017; Zdrazilova et al., 2018). Studies

repeatedly emphasized that gestures are particularly effective in thinking and communicating about visual and spatial information (e.g., Alibali, 2005; Feyereisen & Havard, 1999; Lavergne & Kimura, 1987). Moreover, implications of gesture use on speakers' subsequent cognitive processes (e.g., thinking, memory, problem-solving, decision-making, learning) have been predominantly studied in the spatial context (Alibali & Goldin-Meadow, 1993; Church & Goldin-Meadow, 1986; Chu & Kita, 2011; Glenberg & Kaschak, 2002; So et al., 2015). However, human communication occurs in various contexts. People integrate both spatial and non-spatial content (e.g., abstract concepts) into their speech during naturalistic conversations. Thus, it is pivotal to study both different contexts to unravel the underlying mechanisms of human communication. To this end, the current study attempted to extend earlier studies by examining multimodal expressions and their subsequent effects on cognition in a non-spatial, abstract domain, which is the expression of emotions.

How we communicate emotions in various settings are extensively studied in the literature (e.g., Fitness & Duffield, 2003; Lynch & Chernatony, 2004; Miller & Koesten, 2008). Although emotions can be conveyed through verbal (e.g., speech) and non-verbal (e.g., body language) channels during communication, bodily expressions of emotions, apart from facial cues (e.g., Reisenzein et al., 2013; Sauter et al., 2010), received little interest in the literature. However, studies demonstrated a tight link between emotion and action/motor-related brain areas (e.g., Meyer et al., 2019; Portugal et al., 2020), which implies that emotions and body movements are related at the cognitive level and may affect each other. Given this, examining multimodal communication of emotions bears particular importance to fully understanding how emotionality is embedded in human interactions. Hence, the current study examined emotion communication

through co-speech hand gestures as they constitute a significant part of multimodal human interactions (McNeill, 1992; Kendon, 2004).

The current study opens new directions for future research. First, we examined sequential bilinguals who acquired L2-English later in life with relatively less linguistic proficiency compared to L1-Turkish. However, bilinguals with comparable linguistic proficiencies across L1 vs. L2 (e.g., simultaneous bilinguals) might yield interesting findings on the functions of gestures during communication. Moreover, in the current study, we only measured participants' age of acquisition for L2 linguistic proficiency. Future research might also assess L2 proficiency with more objective and standardized tests (e.g., PPVT-5, Dunn, 2019) across different domains (e.g., speaking, comprehension, reading). Measuring L2 proficiency may provide insight into how gesture use changes in accordance with linguistic competence in L2. Although some studies did not find any correlation between different L2 proficiency levels and gesture use rates (e.g., Nagpal et al., 2011; Nicoladis et al., 2007), studies showed that gesture use is related to linguistic proficiency (Coletta et al., 2010; Hostetter & Alibali, 2007, 2011). Second, we focused on L1-Turkish and L2-English, which substantially differ in both lexical and grammatical morphology. Studies showed that gestures are coupled with lexicon and grammar (e.g., Kok & Cienki, 2016; Lapaire, 2011). Future research might examine different pairs of languages with varying degrees of lexical and morphological similarities. Last, in our study, we narrowed our focus to bilingual speakers' gesture production. However, it is also pivotal to complement these findings with evidence from comprehension domain. Future research can examine whether communicative functions of gestures for L2 communication also extend to the language comprehension, particularly for the processing of emotions.

In conclusion, this study investigated L1-Turkish and L2-English speakers' gesture use during emotional narrative retellings. Speakers used more representational (i.e., deictic) gestures in L2 than in L1, and in negative than positive emotional narratives. Representational (i.e., metaphoric) gesture production was also related to the intensified subsequent ratings of emotional narratives. These findings suggest that (1) speakers might benefit from using gestures as an alternative channel of expression when their verbal proficiency is compromised, and (2) using gestures, like enactment, might facilitate the encoding of abstract notions, particularly when speaking in a language with relatively reduced verbal proficiency. The current study demonstrated novel evidence by extending earlier research to a non-spatial, abstract context. We also contribute to the emotional communication literature by showing that hand gestures play an important role in emotional communication, which may be modulated by speakers' native status.

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Appendix A

1st Narrative Block

1. It has made me better loving you. It has made me wiser, and easier and brighter. Theoretically, I was satisfied. I flattered myself that I had limited my wants. Now I am really satisfied, because I can't think of anything better.
2. Through an underwater veil, I feel hands on my arms pull me away from him. Medics bend down over his body. His eyes are closed now, and I can't see him breathing. When the medics try again to pull me from him, I shove them roughly away and scream.
3. There were days when I was very happy without knowing why. I was happy to be alive and breathing, when her whole being seemed to be one with the sunlight, the color, the odors, the luxuriant warmth of some perfect day. I liked then to wander alone into strange and unfamiliar places.
4. I found the piercing cries from the idiot beside me more and more intolerable, I felt cold fury, I would have liked to slam my fist into the wide, black hole of his shouting mouth. I quivered with rage; I was in a fever.
5. Kız kardeşim hayatımın geri kalanında tekrar tekrar ölecek. Keder sonsuza dek devam eder. Öylece gitmez; her adımda, her nefeste senin bir parçan haline gelir. Kardeşimin yasını tutmaktan asla vazgeçmeyeceğim çünkü onu sevmeyi asla bırakmayacağım.
6. Sahilde yan yana dolaşıyor ve sadece birbirimize bakışıp gülümsüyorduk. Yalnız rüzgârın dolaştığı ve dalgaların yaladığı plajlarda paltolarımıza bürünerek koşuyor ve birbirimizin soğuktan kızaran yanaklarını öpüyorduk.
7. Ağlayacaktım. Neden ağlayacağımı bilmiyordum ama birisi bana bir şey söylerse ya da çok yakından bakarsa gözlerimden yaşların boşanacağını ve bir hafta boyunca

ağlayacağımı biliyordum. Gözyaşlarının içimde kabarıp dolu ve dengesiz bir bardağın içindeki su gibi çalkalandığını hissedebiliyordum.

8. Yağmurda şarkı söylüyorum ve bu gerçekten mükemmel bir his. Bir sağanak oluyor ve kendimi ona bırakıyorum. Yağmurun yağmasına izin verip deli gibi gülümsüyorum. Dans ediyorum çünkü eğer kendimi yağmurda mutlu edebiliyorsam, hayatta iyi bir yere gelmişim demektir.

2nd Narrative Block

1. Seni sevmek beni daha iyi bir hale getirdi. Daha bilge, daha kolay ve daha parlak. Önceden teorik olarak memnundum. İsteklerimi sınırlandırdığım için kendimi methederdim. Şimdi gerçekten tatmin olmuş haldeyim çünkü daha güzel herhangi bir şey düşünemiyorum.
2. Gözyaşlarımın bulanık örtüsünün ardında, ellerin beni ondan ayırdığını hissettim. Acil ekipleri üzerine eğilmişlerdi. Gözleri kapalıydı ve artık nefes aldığını göremiyordum. Doktorlar beni ondan uzaklaştırmaya çalışınca onları sertçe savurdum ve feryat ettim.
3. Nedenini bilmeden çok mutlu olduğum günler vardı. Tüm benliğim güneş ışığıyla, renklerle, kokularla ve mükemmel bir günün bereketli sıcaklığıyla bir olduğu zaman, hayatta olmaktan ve nefes almaktan mutlu olurum. Tuhaf ve tanımadığım yerlere tek başına gitmekten hoşlanırım.
4. Yanımda duran münasebetsizin attığı çığlıklar gittikçe katlanılmaz oluyordu. Öfkeden neredeyse kuduracaktım. Haykırırken açılan ağzının ortasındaki kara deliğe bir yumruk geçirmeyi ne kadar isterdim. Hiddetten titriyordum, nöbete yakalanmış gibiydim.

5. My sister will die over and over again for the rest of my life. Grief is forever. It doesn't go away; it becomes a part of you, step for step, breath for breath. I will never stop grieving her because I will never stop loving her.
6. We were walking side by side on the beach and just looking at each other and smiling. We were running alone in our coats on the beaches which only the wind wandered around and the waves licked. And we were kissing each other's blushing cheeks.
7. I didn't know why I was going to cry, but I knew that if anybody spoke to me or looked at me too closely the tears would fly out of my eyes and the sobs would fly out of the throat and I'd cry for a week. I could feel the tears brimming and sloshing in me like water in a glass that is unsteady and too full.
8. I am singing in the rain. And it is such a glorious feeling. An unexpected downpour and I am just giving myself into it. I just let the rain fall and grin like a madman. I dance because if I can make myself happy in the rain, I am doing pretty alright in life.