A preliminary description of haptices in Italian social-haptic communication: a phonological perspective

Laura Volpato (Ca' Foscari University of Venice)
laura.volpato@unive.it

Abstract

Deafblind individuals experience a combination of partial/complete loss of hearing and sight. They use a variety of communication modes, amongst which social-haptic communication (SHC), which consists of brief tactile messages performed on the body of the deafblind person (haptices). A phonological-like structure can be observed in SHC if we consider the smallest units of touch individuated by Lahtinen (2008), called haptemes. Haptemes can create minimal contrasts in haptices. This contribution discusses whether the recently created Italian haptices also have a phonological structure. According to a preliminary analysis, Italian haptices seem to have their own form of phonology, which responds to physical constraints of signal transmission (such as tactile perceptibility) and to pragmatic contextual factors.

Keywords: Social-haptic communication, deafblind, phonology of touch, tactile perception

1 Introduction

The term deafblind refers to individuals who are completely deaf and blind as well as to persons with varying degrees of hearing and vision impairment (World Federation of the Deafblind 2018). Deafblind individuals use various communication modes, most relying on touch as their preferred communication channel, but not limited to that. For instance, they can use spoken language - mostly supported by hearing aids or cochlear implants; they can digit letters on the hand (in Italy, such system is called Malossi) or simply draw the letters on the palm of the hand (block letters on palm); they can also use a visual sign language from a close distance and/or in a restricted visual frame (adapted signs); or they can use the tactile version of a sign language. The communication mode discussed in the present study is called social-haptic communication (SHC) and consists of haptices: brief tactile messages performed on the body of the deafblind person[1] conveying information regarding the environment and the emotional feedback of the interlocutor (Lahtinen 2008; Bjørge et al. 2015; Raanes and Berge 2017; Hesse and Nielsen 2018; Volpato 2023). SHC is also used by deafblind individuals in the communication with deafblind or sighted interlocutors.

SHC was very little known in Italy until recent times. Thanks to the Erasmus+ project "Social Haptic Signs for Deaf and Blind in Education" (September 2019 - November 2022), SHC

1. According to Bjørge et al. (2015, 10), the person who performs the social-haptic messages can be referred to as 'provider', while the person who receives them can be referred to as 'receiver'.

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codes were developed and recorded in four European countries, including Italy (www.spreadthesign.com/it.it/social_haptic/), where no haptices or only a few existed before (Volpato, Cardinaletti, and Ceccarani 2021; Volpato and Mantovan 2021; Volpato and Markhus 2022; Volpato 2023). The process of creation and negotiation of Italian haptices involved 9 deafblind individuals with various degrees of residual hearing/sight and using different communication modes. The testing and validation of the newly created haptices involved approximately 30 members of the Italian deafblind community and approximately the same number of providers.

The present contribution provides a preliminary description of the Italian haptices from a phonological perspective following Lahtinen's (2008) analysis of Finnish haptices.[2]

The paper is organized as follows. An overview of SHC and its phonological structure is provided in Section 2. Section 3 provides an account for the features of tactile perception that come into play when receiving the haptices. Section 4 focuses on the Italian recently born SHC code and illustrates the methodology of the study: ethics and participants are described in Subsection 4.1, and the methodology applied in data analysis is described in Subsection 4.2. Results are discussed in Section 5. Subsection 5.1 describes the results of a preliminary phonological analysis of Italian haptices. Subsections 5.2 and 5.3 focus on two specific haptemes in Italian SHC: handshape and place of articulation, respectively, and describe their different possible alterations. Subsection 5.4 focuses on the alteration of Italian haptemes due to pragmatic reasons. Section 6 describes the relation between Italian haptices and signs of Italian Sign Language (LIS). Finally, conclusions are drawn in Section 7.

2 Social-haptic communication and its phonology

Social-haptic communication developed and spread in Northern Europe from the 90s (Palmer and Lahtinen 2013; Bjørge et al. 2015) and constitutes a communicative support for deafblind people despite the modes of communication they use since it can combine with any of such modes. It consists of tactile messages performed on the body, called haptices. Haptices can convey information regarding the surrounding environment and the emotional feedback of the interlocutor(s) (Lahtinen 2008; Raanes and Berge 2017; Hesse and Nielsen 2018). Haptices are usually articulated on the back, the (upper) arm, the hand, the knee, and the foot (Bjørge et al. 2015).

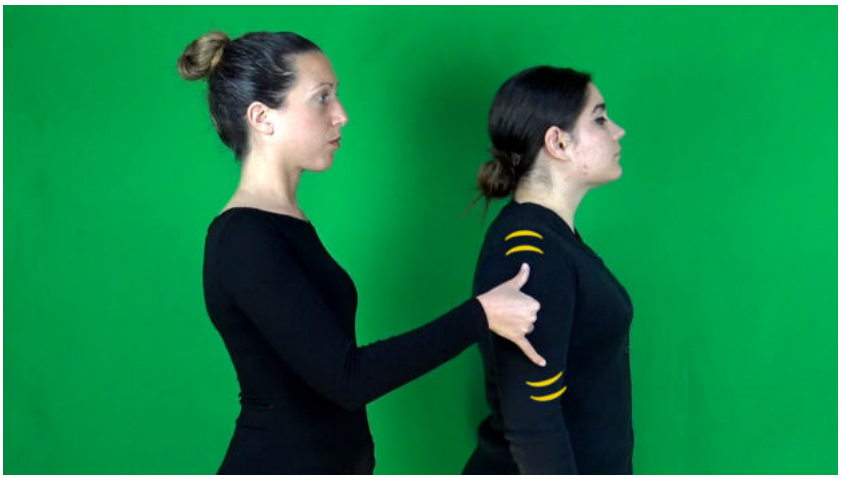
Even if social-haptic communication is attested as a method of communication and not as a natural language, a phonological-like structure can be observed if we consider the smallest units of touch individuated by Lahtinen (2008), called haptemes. According to Lahtinen (2008), social-haptic communication seems to contain a finite set of phonemic units, called haptemes (similar to phonological parameters in sign languages). In Lahtinen (2008) and Lahtinen et al. (2012: 270), the following haptemes have been individuated: direction of movements, change of directions on the body, directions between people, pressure, speed, frequency, size, length, duration, pause, change of rhythm and shape. According to teaching material developed by Lahtinen (lessons delivered in December 2020), haptemes can be grouped into seven phonological parameters: location (also referred to as place of articulation), pressure, movement (and direction of movement), speed, duration, handshape, size. In the Finnish SHC code proposed by Lahtinen, it is possible to see minimal contrast be-

2. The term 'Finnish haptices' refers to the haptices developed by Riitta Lahtinen and Russ Palmer. Their work, mainly based in Finland (and, partially, England), spread to other countries as well and influenced other SHC codes, including the Italian one.

tween the haptice 'I am staying here' and the haptice 'stop/wait'. The former is performed with one flat hand placed on the shoulder and a prolonged contact, while the second is performed with the same articulators, but applying an abrupt heavier pressure. In this case, the hapteme pressure determines the change in meaning. Another minimal contrast can be found between the haptice 'yes' and the haptice 'time' (Lahtinen 2008: 165): the former is performed on any area of the body through a gentle tapping on the body surface, while the second can be performed in the same way but on a specific place of articulation, namely the wrist. In this case, the hapteme determining the contrast is the place of articulation.

According to Lahtinen (2008), haptemes respond to physical constraints. For instance, the Finnish haptice for 'telephone', similarly to the Italian corresponding haptice, is performed with outstretched thumb and little finger (see Figure 1), the thumb and little finger contact surfaces need to be far enough from each other to be correctly interpreted as 'telephone', otherwise the receiver will perceive the whole handshape as one unique contact area (Lahtinen 2008: 163).

Figure 1: The Italian haptice 'telephone', like its Finnish version. Source: www.spreadthesign.com/it.it/social_haptic/.



Pragmatic factors are also relevant in the selection of haptemes. For example, Lahtinen (2008: 165) describes the use of different movements according to the presence or absence of a sighted third party: "sometimes the movements are small, made by small muscle movements and invisible to outsiders [...] The visibility of the movement depends on the extension of the producer's movements, onto which body part the message is made and if the haptice is consciously hidden from other bystanders". Lahtinen (2008: 126) shows that within the same haptice for 'yes', more nuances of the confirmation message can be obtained by changing the haptemes: a smaller or larger handshape communicate a lower or louder tone, respectively; a faster speed communicates an excited tone, while a slower speed and heavier pressure communicate a bored tone.

3 The tactile perception of haptemes

Haptices are perceived through touch, which, from a linguistic point of view, is a rather unexplored field. This section illustrates the features of tactile perception that could influence the reception of haptices.

The human skin is innervated by different tactile receptors (Gallace and Spence 2014, 19–35). A stimulus occurring on the skin is translated into neural signals by mechanoreceptors. Such receptors are characterised by specialised end organs that surround the neural terminals and are responsible for the transduction of information from the external world into electrical signals (Lumpkin, Marshall, and Nelson 2010; Gallace and Spence 2014, 21). A mechanical stimulus delivered to the body surface elicits a deformation of the skin that, in turn, causes a deformation of the end organ of a sensory neuron (Lumpkin, Marshall, and Nelson 2010). If the skin deformation reaches a certain threshold, it generates the so called 'action potentials', which are translated into neural signals and then transferred to higher processing centers within the central nervous system by means of specific neural fibers (Gallace and Spence 2014, 21). When stimuli presented to just one side of the body reach the central neural system, they are mainly projected to the contralateral primary somatosensory cortex (SI) (Jones 1986; Blatow et al. 2007; Gallace and Spence 2014, 29) which is located in the postcentral gyrus of the brain. The organization of SI is somatotopic, which means that the stimulation of different regions of SI elicit tactile sensations referred to specific body areas. Further evidence suggests that SI integrates somatosensory inputs from both sides of the body. Consequently, a complete map of the body surface can be found in SI.

Different body areas exhibit varying degrees of tactile sensitivity. The sensitivity of a body area depends on the number of receptors and afferent fibers that innervate it. For instance, the tongue and the fingertips count as many as 100 receptors per square centimeter, while the back of the hand counts less than 10 (Gallace and Spence 2014, 22). The distribution of the different tactile stimuli on the SI reflects the higher and lower sensitivity of the different body areas. For instance, a broader area of the SI is deputed to the codification of tactile stimuli of the hands and of the lips, while smaller portions of the brain are dedicated to the reception of stimuli coming from the arms, the shoulders, and the torso (Gallace and Spence 2014, 30).

Importantly, the organization of the somatosensory map in SI is similar to that of the motor map. This close somatotopic correspondence reflects the relevant relationship that exists between touch and movement. For instance, the areas of the brain responsible for the perception of touch on the hands in SI are mostly located in front of those brain areas responsible for the movement of the hands (Gallace and Spence 2014, 30).

Given the different distribution of tactile receptors on the skin (Gallace and Spence 2014; Corniani and Saal 2020, 1229), the perception of a shape in contact with the body can change according to the body area in which the haptice is articulated. For instance, a smile drawn with the index finger on the receiver's arm could be perceived as too small and subtle when performed on the back, and the handshape could change accordingly (e.g., the smile could be drawn with the ulnar/radial side of the hand). Larger contact surfaces are usually better perceived on most body areas, since a broad contact surface assures a higher number of receptors activated, which means that larger contact surfaces are preferred over smaller contact surfaces on less sensitive body areas. Additionally, according to the different distribution of receptors on the body, if we need the receiver to discriminate between two different referents located on the body surface through pointing, the two points of contact must be distant enough to be perceived as two different loci. The lower the density of receptors on that body area, the higher the distance that must divide the two loci (see Section 2, Figure 1). This can cause the modification of handshape according to the body area in which the haptice is articulated (e.g., the distance between index and third finger is sufficient to locate two different referents on the back of the hand but not on the back of the torso, where two distant index fingers – two hands – are needed).

When the skin is covered with thick layers of textile, the threshold for the action potential generated by tactile receptors is higher. Thus, in these cases, the haptice might need to be articulated with a higher pressure and relocated on other more sensitive body areas.

According to the features of touch perception illustrated so far, it is possible to hypothesize that haptemes are subjected to a certain degree of variation. Also, it is possible that some haptemes are less subject to variation than others, and that such haptemes have a greater perceptual weight in SHC from the receiver's perspective. For instance, given the tight relationship between touch and movement, visible in the organisation of the somatosensory and motor maps in the brain cortex, and given the mechanical functioning of touch, based on the deformation of the skin caused by contact and pressure, it might be possible that from the receiver's point of view, the haptemes of movement and pressure have a prominent role.

Sighted researchers are visually aware of the haptices. Such perceptual bias may overshadow the tactile aspects of haptemic contrasts. For this reason, it is fundamental that researchers on SHC have both experience of providing and receiving haptices and, most importantly, that deafblind SHC users are involved in the research.

4 Methodology

SHC was very little known in Italy until recent times. Italian deafblind individuals tended to use home-made haptices, lacking a standardised system. The Erasmus+ project "Social Haptic Signs for Deaf and Blind in Education" (September 2019 - November 2022) aimed to gather haptices used in four European countries (Estonia, Italy, Portugal, and Sweden) to make them available on an online video-dictionary through video-recordings, pictures, and descriptions (Volpato, Cardinaletti, and Ceccarani 2021; Volpato and Markhus 2022; Volpato 2023). The project represented an opportunity to develop SHC codes in those European countries where no haptices or only a few ones existed, as in the case of Italy. Ca' Foscari University of Venice and the Foundation Lega del Filo d'Oro E.T.S. worked in close collaboration with the Italian deafblind community members for the creation and spreading of the new Italian SHC system. The process of negotiation and co-creation of the haptices was carried out during both in-person and online meetings and involved 9 deafblind individuals from the North of Italy with various degrees of residual hearing/sight who use different communication modes, such as Tactile Italian Sign Language (LISt), adapted Italian Sign Language (LIS), spoken Italian, block letters on palm, Malossi and Braille.

The resulting 123 new haptices were uploaded to an open-source online dictionary for SHC, a dedicated section of the SpreadTheSign dictionary (www.spreadthesign.com/it.it/social_haptic/). To spread and test the newly created SHC code, a selection of haptices was taught to a large group of deafblind individuals and providers during two editions of the summer holidays organised by the Foundation Lega del Filo d'Oro E.T.S. at seaside and mountain places (July-September 2022 and July 2023). During the holidays, it was observed whether the participants used the haptices and how. The collected haptices will be discussed from a phonological perspective in Section 5.

4.1 Ethics and participants

The data collection was registered within BemboLab, an international inter-university research centre of Ca' Foscari University of Venice (https://www.unive.it/pag/40828/), and the procedures were approved by the Ethics Committee of Ca' Foscari University of Venice. Faces are blurred according to regulations on data protection.

All participants were informed of the SHC activity during the summer holidays. Participants who were photographed, video-recorded and interviewed signed an informed consent. To guarantee full accessibility of the informed consent for deafblind participants, the text was translated by the volunteers with the supervision of the researcher-interpreter using the deafblind person's preferred communication method.

The participants involved in the testing of haptices during the summer holidays editions were 35 deafblind individuals and 33 providers in 2022 and 25 deafblind individuals and 32 providers in 2023.

Except for those who were part of the negotiation group, none of the other participants had previous knowledge of SHC. The researcher, as a guide-interpreter for the deafblind, could take part in the recreational activities, communicate with all deafblind participants, and observe if and how SHC was used by the deafblind-volunteer pairs.

4.2 Methodology in data analysis

Data analysis is based on 87 Italian haptices out of the 123 included in the SpreadTheSign dictionary section dedicated to SHC. The haptices for letters (26) and numbers (10) were excluded from the present phonological analysis, since they consist in the exact representation of alphabetic and numeric symbols on the body of the receiver. Their origin lies in the written language and differs in terms of negotiation with respect to the remaining haptices. Video recordings, interviews and personal observations have been used to study the actual use of Italian haptices by deafblind and sighted participants. Naturalistic data have allowed us to compare the citation form of the haptices, as found in the video-dictionary, with their actual use in different communicative contexts.

ELAN (https://archive.mpi.nl/tla/elan) and Excel have been used to analyse each haptice according to Lahtinen's (2008) theory of haptemes. The parameters considered are handshape, place of articulation, pressure, type of movement, duration, speed, size. To best describe the different handshapes of the Italian SHC code, I applied the terminology used for naming the different LIS handshapes as described in Branchini and Mantovan (2020; 2022).

5 Results and discussion

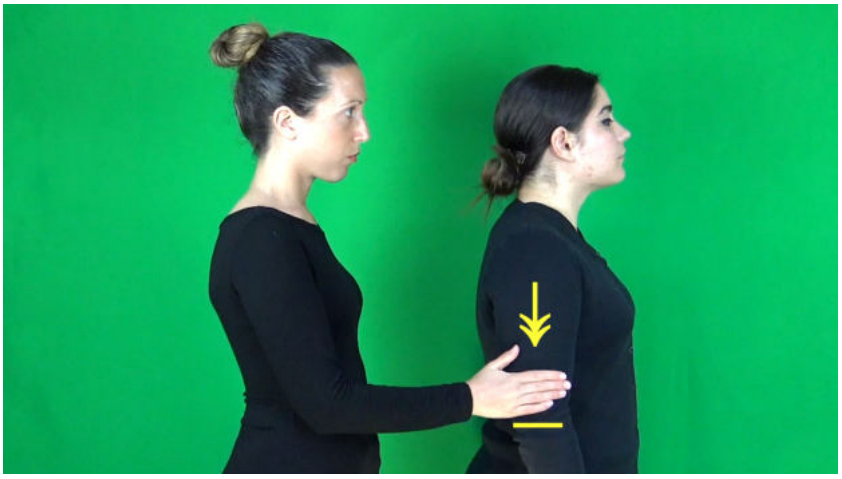
This section presents the results of data analysis and discusses the findings on Italian haptices from a phonological perspective. Subsection 5.1 describes the results of a preliminary phonological analysis of Italian haptices. Subsections 5.2 and 5.3 focus on two specific haptemes in Italian SHC: handshape and place of articulation, respectively, and describe their different possible alterations. Subsection 5.4 focuses on the alteration of Italian haptemes due to pragmatic reasons.

5.1 A preliminary phonological analysis of Italian haptices

The analysis shows that haptices can be articulated with one or two hands, on different parts of the receiver's body. The analysis revealed that the classification of haptemes proposed by Lahtinen (2008) can be applied to Italian haptices as well. Each haptice is articulated as a specific combination of haptemes. For instance, the Italian haptice 'tired', as illustrated in Figure 2, is articulated on the receiver's arm (place of articulation) with open flat hand (handshape) performing a downwards movement (type of movement) applying high pressure (pressure), with normal speed (speed), and prolonged duration of contact in the end

of the movement (duration). The maximum size of the movement approximately covers the arm length from the shoulder to the elbow (size).

Figure 2: The Italian haptice 'tired'. The double arrow indicates the pressure applied to the downward movement. Source: www.spreadthesign.com/it.it/social_haptic/.



When one of the selected haptemes changes, the result can be a non-existing haptice or a haptice that conveys a different message, thus creating a minimal or a near-minimal pair. For instance, if the haptice 'tired' is articulated with an upwards movement, it creates a non-existing haptice; if it is articulated without pressure, it can be interpreted as 'I am back'.

Like phonological parameters in sign languages, Italian haptemes seem not to carry meaning per se; they contribute to create distinct meaning and can create minimal pairs. Italian haptemes are considered contrastive units given their capability to produce change of meaning.

In the next sections, handshape and place of articulation in Italian SHC will be further analysed, also in relation to the degree of variation that they admit.

5.2 Handshape and contact surface

The inventory of handshapes used to articulate the 87 analysed Italian haptices (simple forms) includes: handshape 5 (46 occurrences), G (15 occurrences), V (5 occurrences), L (2 occurrences), S (2 occurrences), Y (2 occurrences), 3/5 (2 occurrences), and F (1 occurrence). In Italian SHC, compounds are found as well (for instance, the haptice for 'volume', or the one for 'wardrobe'). They originate from the combination of two haptices and display the following handshapes: S+5 (2 occurrences), G+5 (2 occurrences), and F+5 (1 occurrence). Within the number of analysed haptices, some are related to mobility: 7 haptices are used when guiding the receiver arm in arm.[3] Such haptices do not display a specific handshape, but rather involve the use of the whole guiding arm and the movement of the body (for instance, the guiding arm and the whole body of the guide, orientate to the left and this is interpreted as 'turn left').

3. Guiding positions may vary from person to person. Some deafblind individuals prefer to grab the guide's arm just above the elbow; some others prefer to place their hand on the guide's shoulder; some choose to walk in front of the guide and receive SHC on the back for directions. Some deafblind individuals, especially if they have balance difficulties, prefer to walk arm in arm with the guide. The example provided above, refer to the arm in arm guiding position.

Within the Italian available haptices, the more frequent selection of handshape 5 (with its variants, as illustrated in Figure 3) instead of handshape G (Figure 4) can be related to the larger contact surface offered by handshape 5 than that offered by handshape G.

Figure 3: Handshape 5 with its variants in Italian haptices

Figure 4: Handshape G in Italian haptices

The selected handshapes for Italian haptices offer this articulatory possibility and can be performed with a heavy pressure. In fact, whereas LIS phonology admits both G and I handshapes, Italian haptices do not display the I handshape. Despite the quite similar quantity of contact surface offered by G and I and a similar "pointing" shape, the former allows the provider to apply a heavier pressure, while the latter does not. Figure 5 illustrates handshape I as attested for LIS.[4]

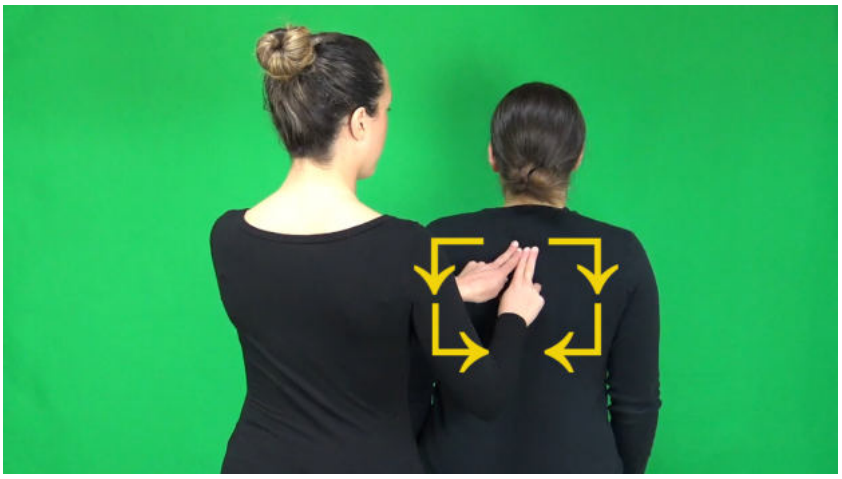
Figure 5: Handshape I in LIS. Source: Branchini and Mantovan (2022: 127)

Most Italian haptices admit modifications of the handshape in order to cope with tactile perception principles. For instance, as illustrated in Figure 6, the shape of a room can be drawn on the receiver's back by using handshape G or V (unspread), without changing the meaning of the haptice.

Similarly, the Italian haptice for 'yes' admits different handshapes without changing its meaning, but rather altering the tone of the message. For instance, if it is articulated with a smaller contact surface such as handshape G, it conveys a lowered tone than if articulated with a larger handshape (with two-to-five fingers). Figure 7 illustrates the Italian haptice for 'yes' articulated with the index finger, while the rest of the hand maintains the contact with

4. The Norwegian SHC code works similar to the Italian one in this respect and shows no use of the I handshape (Bjørge et al. 2015: 18-27).

Figure 6: The Italian haptice for 'room' articulated with V (unspread) handshape. Source: www.spreadthesign.com/it.it/social_haptic/.



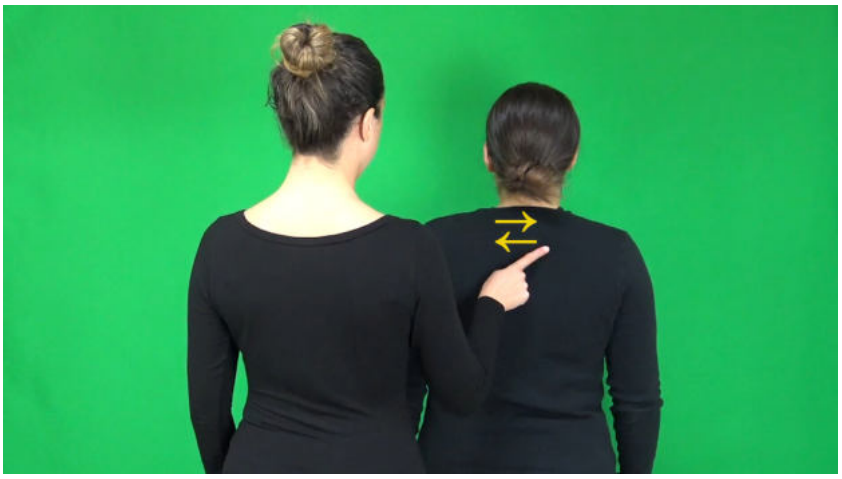
the arm of the receiver. The Italian haptice for 'no' (Figure 8), which deafblind informants have agreed to articulate with handshape G, during the testing has proven to be understood also when articulated with larger handshapes (with two-to-five fingers).

Figure 7: Italian haptice for 'yes' articulated with the index finger.

Another kind of minimal contrast can be observed in Italian haptices when looking at the contact surface rather than at the whole handshape. The contact surface is determined by the combination of the handshape and its orientation towards the receiver's body. For instance, between the Italian haptices 'level-down' (Figure 9) and 'tired' (Figure 10) a near-minimal contrast[5] can be observed, created by the different type of hand-surface in contact with the receiver's body: in 'level-down', the contact surface is the ulnar side of the hand, in 'tired' it's a flat hand. If the contact surface is the radial or ulnar side of the hand, when

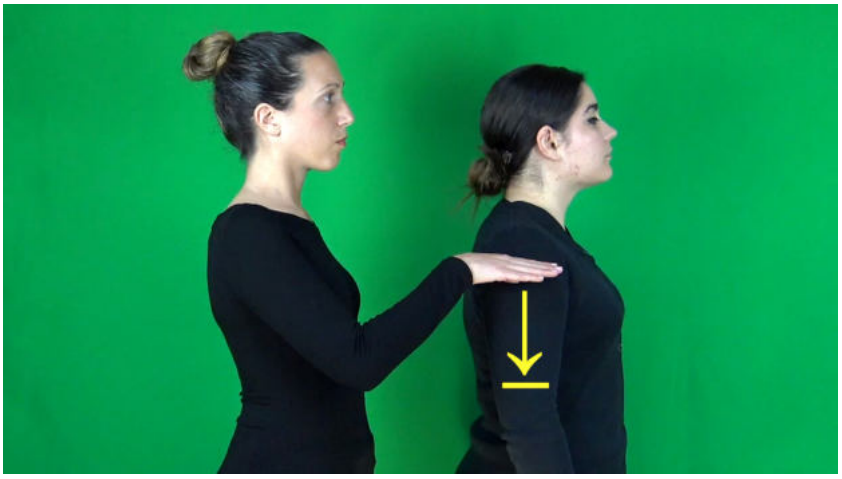
5. The haptice 'level-down' can be articulated with heavy pressure as in 'tired' without changing its meaning.

Figure 8: The citation form of the Italian haptice for 'no', articulated with handshape G. Source: www.spreadthesign.com/it.it/social_haptic/.



the palm is oriented towards the ground, it creates the feeling of a level bar that wrinkles the body surface while moving upwards or downwards. The same movement performed by a flat compact surface, as in 'tired', provides the receiver with a completely different perception.

Figure 9: In the Italian haptice 'level-down' the contact surface is the radial/ulnar part of the hand. Source: www.spreadthesign.com/it.it/social_haptic/.



Another example of the possible contrastive nature of the contact surface in Italian haptices is provided by the near-minimal pair 'direction-straight' and 'raise-hand'. The former is articulated with lateral contact surface (as in Figure 15) and the latter is articulated with slightly more pressure and a flat hand contact surface.

We observe that the great variability of the handshape parameter does not impede the correct interpretation by the receiver. Nevertheless, the observations reported above may lead to hypothesize that in Italian SHC, it is not the handshape that creates minimal contrast, but rather the type of contact surface.

5.3 Place of articulation

The Italian haptices object of the present analysis are articulated on the following body areas: the arm, the back, the hands, the feet, the knees, the shoulder, and the front upper trunk (just below the clavicle). The front upper trunk, which is restricted to the area below to the clavicle, is attested for one haptice only ('you', illustrated in Figure 10), and its use for the articulation of haptices is quite sensitive to the receiver's preferences. In the case of mobility haptices used when guiding the receiver arm in arm (see Section 5.2), the place of articulation is mainly the receiver's arm, but other contact areas are not excluded (for instance, the waist), depending on the distance between the two bodies.

Italian SHC displays near-minimal pairs in which the place of articulation is (nearly) the only distinctive hapteme, for instance: 'time' and 'yes'. This minimal pair, which also exists for the SHC code proposed by Lahtinen, holds if 'yes' is articulated with G handshape.[6]

Another example in which the place of articulation creates a minimal pair is that of 'you', articulated with G handshape on the front upper trunk (Figure 10), compared with the same combination of articulators applied to other body areas, which refers to a third person/object. Figure 11 illustrates the example of handshape G used as location marker for a referent: the sun, rising on the level of the sea, while the right hand depicts the sun rays.

Figure 10: The Italian haptice 'you' articulated with G handshape on the front upper trunk, next to the clavicle. Source: www.spreadthesign.com/it.it/social_haptic/.

Despite the examples of minimal contrast due to the change of the place of articulation, most of Italian haptices admit different places of articulation without changing their meaning. For example, the Italian haptice 'waiter', which is performed with handshape 5 (i.e., all fingers closed in a fist) can be articulated on different body areas without changing its meaning, as shown in Figure 12 and 13. The change of the place of articulation can be due, for instance, to a different position of provider and receiver in the space (e.g., sitting in front of each other or side by side).

The selection of the place of articulation is connected to the body position of the provider and receiver and the position of other referents in space. In the first case, the position of both provider and receiver can select different places of articulation according to articulatory constraints. Below, the places of articulation are listed in relation to the position of the

6. In this case, the smaller contact surface of handshape G with respect to handshape 5 creates an effect similar to that of a lowered tone of voice but does not affect the meaning of 'yes' (see Subsection 5.2).

Figure 11: The provider articulates with the left hand a pointing sign in Italian SHC locating the sun rising on the sea level, while with the right hand she depicts the sun rays.

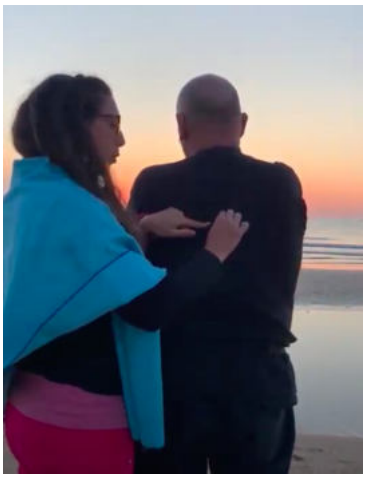
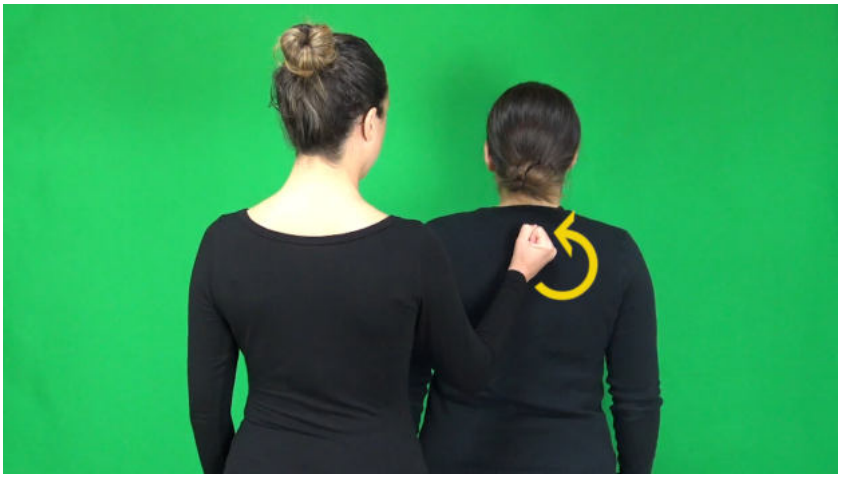


Figure 12: The Italian haptice 'waiter' in its citation form, articulated on the back. Source: www.spreadthesign.com/it.it/social_haptic/.



interlocutors. Both standing and sitting positions are understood to be without obstacles in between (e.g., a table, a fence) and within arm's length; sitting positions do not consider chairs with a high back covering the whole back of the receiver:

- standing position | side by side —> back, upper arm, forearm, hand
- standing position | in front of each other —> forearm, hand, (front upper trunk)[7]
- standing position | one behind the other —> back, shoulder, upper arm
- sitting position | side by side —> back, upper arm, forearm, hand, knee, foot

7. The articulation of haptices on the front upper trunk is less frequent and must be carefully agreed with the receiver in advance since it is considered a sensitive and private area of the body.

Figure 13: The Italian haptice 'waiter' in use, articulated on the arm.

- sitting position | in front of each other —> forearm, hand, knee, foot, (front upper trunk)
- sitting position | one behind the other —> back, shoulder, upper arm

In the second case, the presence of referents in front of the receiver (e.g., an audience) can determine the choice to use the back as place of articulation, so that provider and receiver can share the same perspective with respect to the audience.

Figures 14, 15, and 16 provide examples of sitting and standing positions adopted by both deafblind and sighted providers and receivers.

Figure 14: A deafblind provider articulates the Italian haptice 'yes' (in the game context, it means 'you can start') on the hand of the deafblind receiver. They are sitting in front of each other.

One of the main features of SHC is that it allows communication to continue even when the habitual communication channel is not available. Therefore, the possibility to change

Figure 15: A sighted provider articulates the Italian haptice 'direction straight' on the back of the deafblind receiver. They are in standing position one behind another.

Figure 16: A deafblind provider articulates the Italian haptice 'no' on the shoulder of the deafblind receiver. They are sitting side by side.

the place of articulation and maintain the meaning of the haptice unaltered is an important feature of Italian SHC and SHC in general, since it allows a continuity of communication even when assuming different positions in space.

5.4 Pragmatic alterations of haptemes

The change of the place of articulation can also be due to the presence of a third person at the table and to his/her role in the conversation. For example, if the deafblind person is invited to a very formal lunch meeting with his/her chief, haptices might be preferably performed in a more subtle way, on a body area that is neutral and discrete, like the back; vice versa if it's a very informal meeting amongst friends, provider and receiver can exchange messages on the arms or on the knees under the table, according to which position is more comfort-

able for both of them. As the result of flexibility in body positions, handshape also allows different realizations, assuring a good tactile reception in different communicative situations. According to contextual/pragmatic factors like the position of referents with respect to the provider/receiver; the type of communicative event; the communicative intention and prosody, other haptemes can be modified as well. For instance, if the deafblind receiver is giving a speech in front of a sighted audience, the haptice for directions can be performed with more subtle movements, shorter in size, so that the audience does not see what the deafblind speaker can "see" about them. What cannot change in the movement parameter is the type of movement, namely the direction and the straight trajectory.

6 The relation between Italian haptices and LIS signs

The present analysis also allowed us to identify the different origins of Italian haptices. The process of negotiation itself enabled us to monitor the phonological choices made by deafblind participants when creating a new haptice.

Some Italian haptices originated from direct bodily experience. This can be observed in the Italian haptice for 'laugh' illustrated in Figure 17, which recalls the shaking of the body when laughing or the shaking that can be felt when sitting close to a person that is laughing.

Figure 17: The Italian haptice for 'laugh', imitating the shaking of the body.

Other haptices originated from the visual and tactile experience of the referent. For instance, the Italian haptice for 'room' recalls the squared perimeter that can be perceived both visually and tactilely, by manual and physical exploration of the environment or of an embossed map. While the Italian haptice for 'laugh' is quite distant from the correspondent LIS sign, some Italian haptices originated from LIS signs. This can be observed in the haptice 'walk' (as illustrated in Figure 18), which simulates the steps of a person by alternating the movement of index and middle finger, as in the LIS sign WALK.

Some Italian haptices originated from the LIS sign, but the sign was adapted to optimize the tactile reception. For example, to obtain the Italian haptice 'interpret' (Figure 20), the correspondent LIS sign (INTERPRET), as illustrated in Figure 19, underwent some changes: the contact surface was increased (handshape 5 instead of V) and contact with the body of the receiver is maintained during the oscillating movement, instead of being interrupted, as in the LIS sign.

Figure 18: Italian haptice for 'walk'. Source: www.spreadthesign.com/it.it/social_haptic/.

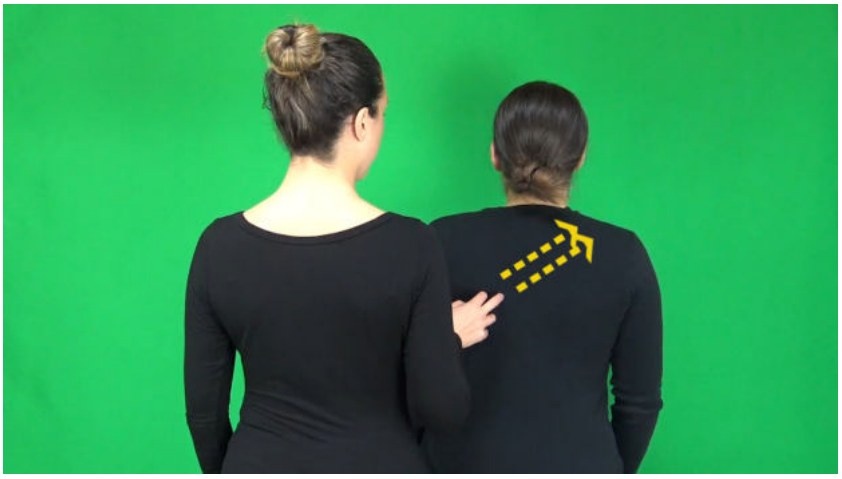
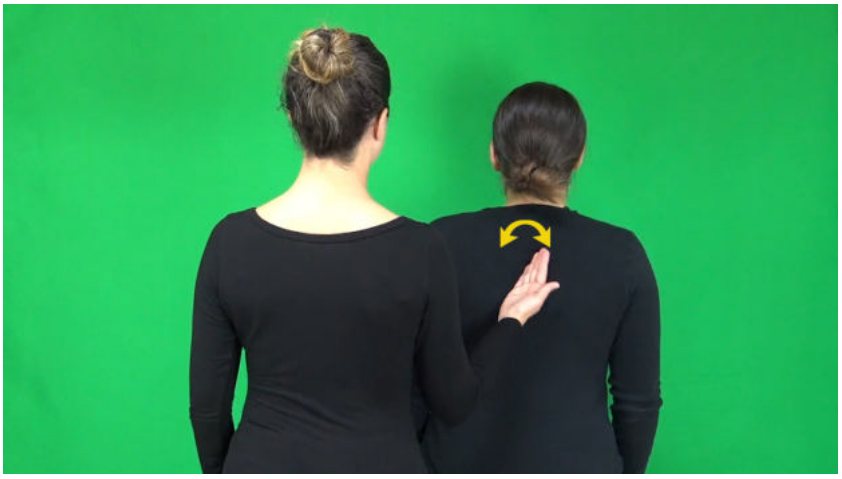


Figure 19: The LIS sign INTERPRET. Source: spreadthesign.com/video/mp4/17/462759.mp4.

Figure 20: The Italian haptice 'interpret'. Source: www.spreadthesign.com/it.it/social_haptic/.



7 Conclusions

In this contribution, the phonological structure of the recently generated Italian SHC code has been discussed.

The analysis revealed that the classification of haptemes proposed by Lahtinen (2008) can be generally applied to Italian haptices as well. Each Italian haptice is articulated as a specific combination of haptemes: handshape, place of articulation, pressure, type of movement, duration, speed, size. This paper examined a small portion of the inventory of Italian haptemes, focusing on place of articulation and handshape, and presenting examples of relevant minimal pairs.

Italian haptices, according to the features of tactile perception, seem to display a great variability both in the handshape and in the place of articulation. In the case of handshape, a different categorization of the hapteme is proposed, suggesting that the minimal contrast is created by the surface in contact with the receiver's body rather than the handshape alone. The contact surface is determined by the combination of the handshape and its orientation towards the receiver's body. The near-minimal contrast between the Italian haptices 'tired' (Figure 2) / 'level-down' (Figure 9) and 'direction-straight' (Figure 15) / 'raise-hand' (described in Section 5.2) could be explained by the different contact surface applied.

The present analysis also showed that the phonology of haptices seems to respond to both physical constraints (body positions and tactile perceptibility) and pragmatic contextual factors.

Italian haptices result from different sources: not only proprioceptive and tactile experiences, which are part of the deafblind culture, but also the visual experiences that are mostly typical of (visual) sign languages. As a result, some Italian haptices have a link to LIS signs, but they are modified according to a tactile rather than a visual perspective.

Further research is needed to define a more complete phonological inventory of Italian haptemes and to explore more in depth the phonological properties of haptices in relation to tactile perception, tactile and proprioceptive iconicity, and deafblind culture. These studies could shed a new light on the same concepts applied to spoken and sign languages, helping us grasp more bits of the extremely complex human language faculty.

References

Bjørge, Hildebjørg Karlsen, Kathrine Goborg Rehder, Magni Øverås, and Helen Keller National Center. 2015. *Haptic Communication: The Helen Keller National Center's American Edition of the Original Title Haptisk Kommunikasjon.* Helen Keller National Center.

Blatow, Maria, Ernst Nennig, Anita Durst, Klaus Sartor, and Christoph Stippich. 2007. "fMRI reflects functional connectivity of human somatosensory cortex." *NeuroImage* 37 (3): 927–936. https://doi.org/10.1016/j.neuroimage.2007.05.038.

Branchini, Chiara, and Lara Mantovan. 2020. *A Grammar of Italian Sign Language (LIS).* Venice: Edizioni Ca' Foscari. https://doi.org/10.30687/978-88-6969-474-5.

———. 2022. *Grammatica della lingua dei segni italiana (LIS).* Vol. 2. Lingue dei segni e sordità. Venice: Edizioni Ca' Foscari. https://doi.org/10.30687/978-88-6969-645-9.

Corniani, Giulia, and Hannes P. Saal. 2020. "Tactile innervation densities across the whole body." *Journal of Neurophysiology* 124 (4): 1229–1240. https://doi.org/10.4324/9780203224342.

Gallace, Alberto, and Charles Spence. 2014. *In touch with the future: the sense of touch from cognitive neuroscience to virtual reality.* 1st ed. Oxford: Oxford University Press.

Hesse, Pia, and Gerd Nielsen, eds. 2018. *Haptic Signals – 139 new and known signals.* https://www.deafblindinformation.org.au/wp-content/uploads/2021/05/haptic-signals-139-new-and-known-signals-english.pdf.

Jones, Edward G. 1986. "Connectivity of the Primate Sensory-Motor Cortex." In *Sensory-Motor Areas and Aspects of Cortical Connectivity,* edited by Edward G. Jones, Alan Peters, Edward G. Jones, and Alan Peters, 5:113–183. Series Title: Cerebral Cortex. Boston, MA: Springer US. https://doi.org/10.1007/978-1-4613-2149-1_4.

Lahtinen, Riitta, Russ Palmer, and Stina Ojala. 2012. "Visual Art Experiences Through Touch using Haptices." *Procedia - Social and Behavioral Sciences,* The 5th International Conference of Intercultural Arts Education 2012: Design Learning, University of Helsinki, Finland, 45:268–276. https://doi.org/10.1016/j.sbspro.2012.06.563.

Lahtinen, Riitta Marita. 2008. *Haptices and haptemes: a case study of developmental process in social-haptic communication of acquired deafblind people.* 1st ed. Frinton on Sea, Essex: A1 Management UK.

Lumpkin, Ellen A., Kara L. Marshall, and Aislyn M. Nelson. 2010. "The cell biology of touch." *Journal of Cell Biology* 191 (2): 237–248. https://doi.org/10.1083/jcb.201006074.

Palmer, Russ, and Riitta Lahtinen. 2013. "History of Social-Haptic Communication." *DbI Review* 50:68–70.

Raanes, Eli, and Sigrid Slettebakk Berge. 2017. "Sign language interpreters' use of haptic signs in interpreted meetings with deafblind persons." *Journal of Pragmatics* 107:91–104. https://doi.org/10.1016/j.pragma.2016.09.013.

Volpato, Laura. 2023. "The development of a social-haptic communication dictionary, a new communication resource for the deafblind in Italy." In *INTED2023 Proceedings,* 7442–7449. Valencia: IATED. https://doi.org/10.21125/inted.2023.2031.

Volpato, Laura, Anna Cardinaletti, and Patrizia Ceccarani. 2021. "A European online dictionary for social haptic communication." *DbI Review* 65:29–32.

Volpato, Laura, and Lara Mantovan. 2021. "A proposal for the integration of social-haptic communication in the training of (Tactile) Italian Sign Language interpreters." In *Global Insights into Public Service Interpreting. Theory, Practice and Training,* 1st ed., edited by Riccardo Moratto and Defeng Li, 240–254. London: Routledge.

Volpato, Laura, and Kaisa Markhus. 2022. "Haptisk prosjekt." *SynHør Bladet. Landsforbundet for Kombinert Syns- og Hørselshemmede / Døvblinde,* nos. 3/2022, 14–17.

World Federation of the Deafblind. 2018. *At risk of exclusion from CRPD and SDGs implementation: Inequality and Persons with Deafblindness.* http://www.wfdb.eu/wp-content/uploads/2019/04/WFDB-global-report-2018.pdf.