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Coining Tactile Signs: A Guided Experience of Tactile Communication for People with Acquired Deafblindness and their Communication Partners

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Abstract

Introduction: When hearing and vision are affected simultaneously, communication can be challenging (Nordic Welfare Centre, 2016). However, undertaking a bodily – tactile modality of communication can benefit the interactions for people with acquired deafblindness and their partners (Lahtinen, 2008). This research aimed to understand the process of creating tactile communication. It focused on analysing the process of coining tactile signs for specific objects. **Method:** A qualitative and descriptive case study was conducted, utilizing video-analysis and questionnaires. An intervention was based on a learning guide and inspired by the project Landscape of Touch (Tactile Communication Group DbI, 2012). Different activities of tactile communication, progressive in complexity, led the participants to a final experience of coining (the creation of) their own tactile signs. **Results:** The results showed three blended stages in the coining process, tactile exploration, information selection and negotiation of meaning. The coined signs were compared with their visual pair of NZSL [New Zealand Sign Language] finding several similarities in their components. This research had an expanding effect on the participant's perspective of tactile communication and the possibility of integrating it to their daily life. **Conclusion and Discussion:** Further research on sign coining and tactile elements in the communication, including individual experiences, is essential for developing good practices for educators and support service providers in this field. It is recommended to use video analysis as a tool to observe the details in the handmovements. Some limitations in this study were the application in a case study, therefore no generalisations can be made, and the access to technology limited the possibilities for other possible participants.

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Keywords

acquired deafblindness, tactile communication, coining signs

Introduction

Acquired Deafblindness [ADB] refers to a dual sensory loss, affecting both hearing and vision and installed after language development. It is a unique disability that can limit independent life affecting orientation and mobility, and restrict on social participation (Nordic Welfare Centre, 2016). Communication can become challenging as they cannot rely on their vision or hearing to understand the message (Gullacksen, Henningsen Ronnblom, Koppen, Jorgensen, 2011). Isolation can be prevented with specific support in alternatives of communication (Gullacksen et al., 2011). By adjusting to a bodily tactile modality and creating awareness of their tactile sense, people with ADB can receive information and improve their communication (Lahtinen, 2008). Such tactile competence can be learned and developed, as other skills do with the right guidance.

Tactile Sign Languages usually emerge from an already stablished visual Sign Language. They start as agreements for communication of Deaf people that lost their vision over time, beginning in home environments and gradually become arbitrary and official through education settings. Examples are found in some Scandinavian and North America countries (Edwards, 2014; Mesch, 2001).

Although New Zealand Sign Language is recognized as one of the official languages of the nation since 2006 (Office for Disability Issues NZ, 2018), a tactile version of NZSL is not official and there are little records of its use. Most people with ADB communicate orally and have no knowledge of sign language (BLVNZ, personal communication, April 23, 2020).

This research aimed to bring tactile communication closer for people with ADB through a self-paced learning guide. By experiencing different methods of tactile communication, the participants were lead to create, agree and coin their own tactile signs. The research focused on the process of coining as an alternative for communication.

Theoretical Framework

The tactile sense is the primary stage of communication for all humans (Nicholas et al., 2019) appearing from infancy. The sense of touch is innate to the humans, it provides us with more information about the environment than we are usually aware off (as cited in Lundqvist et al., 2013). Our bodily-tactile sensations are organized in three groups: *discriminative touch* (light touch, vibration, and pressure), *temperature and*

pain, and *proprioception*. Proprioception is the awareness of our body in space, our posture, orientation, location, and movements (Nicholas et al., 2019). When vision is affected, the proprioception needs to be attuned to learn to orientate independently. Tactile perception refers to the ability for detection, selection, and categorization of bodily-tactile sensations. It is needed to recognize, register, and process all sensations. Improving the competence in tactile perception helps the communication of people with deafblindness (Lahtinen, 2008). Tactile perception comes from an active touch rather than a passive touch. Active is described as all movements (including hand use) with the intention of explore the environment. However, passive touch gives us information without an active movement (Nicholas et al., 2019).

The study focused on the properties of active touch as exploratory procedures [EPs], developed and described by Lederman & Klatzky since 1987. These were also defined as "certain types of hand movements made to get specific information about object properties" (Withagen et al., 2013, p. 1451). Their study examined the influence of age, visual status, and experience with the use of EPs while exploring specific objects. It revealed that repetition of the task increased the efficiency in the exploration, and found typical patterns of EPs, matching results with previous studies from Lederman & Klatzky (1987) (as cited in Withagen et al., 2013).

While tactile perception comes natural to both sighted and blind people, communicating in a tactile modality can be challenging without specific guidance. Deafblind International [DbI] advice hearing and sighted partners to create conscious awareness of their tactile sense and its complexity. The Tactile communication group from DbI. created the work "Landscape of touch" a DVD Video and companion guide. This one offer images that show a "shift in perspective required to enter the rich unique world of tactile experience that is inhabited by people who are deafblind" (Tactile Communication Group DbI, 2012).

Tactile communication involves on-body signing over one's own or the partner's body (Lundqvist et al., 2013). Tactile languages have been studied in early 1795 by Lorenzo Hervas y Panduro, stating that these are as natural as any other sign or spoken language, given the perceiving nature of it from people with deafblindness. Tactile languages are formed by all body utterances contributing to the creation of meaning (Ivanova, 2019). The signing space usually has the form of hand over hand signing. This dynamic creates a dialogue position where there are "talking hands" and "receiving/listening hands". The receiver engages through a light touch over the hands of the talker/signer to follow the message (Lundqvist et al., 2013).

Nafstad & Rødbroe (2015) described clear elements on tactile communication: a) *Tactile pointing/ Deictic touch gestures*: when the signer points in the direction he wants the receiver to acknowledge; b*) Iconic gestures/ signs*: representations of a bodily tactile

impression; c) *Mimetic gestures/ signs*: imitating actions and referring to the perspective of the signing person, these may include an emotional dimension; d) *Metaphoric gestures*: signs that compare to a previous experience; e*) Proto -signs*: specific tactile signs that have not been negotiated yet.

Other officialized forms of tactile communication are Braille reading (feeling the Braille code of tactile raise dots) and TADOMA method of reading speech by feeling the speaker's face while they talk (Tactile Communication Group DbI, 2012). These are not languages themselves but support of either a written or spoken language. As a complement, tactile cues or haptic signs can give visual and auditory feedback about the social and physical environment without interrupting a conversation (Lundqvist et al., 2013). Tactile haptics are conventional and must be agreed on beforehand or taken from a cultural platform. People with ADB can particularly benefit from haptic communication, because it's not a language itself but a tool for sharing information over sign or spoken language (Lahtinen, 2008).

Gestures differ from sign languages in their structure. Sign Languages are complete linguistic systems with their lexicon and grammar and relate to a specific culture.

Gestures, on the contrary, are used by most people to support their speech. They are mostly improvised and cannot be considered linguistic (Kendon, 1997). Previous studies have shown that signs and gestures overlap depending on their iconicity (Ortega et al, 2020). The concept of iconicity is described in sign languages theories and refers to a similarity between the form and the meaning of a sign (Van der Kooij & Crasborn, 2016). Tactile iconicity starts with bodily tactile image that becomes a gesture (Nafstad & Rødbroe, 2015).

Coining new signs implicates agreement and negotiation. Coining refers to the creation of a new sign or word for a concept or meaning that did not have a significant label in that language before. A sign or word in a language is created from lexical items of the same language or combining lexical items from other languages (Bellugi & Newkirk, 1981).

Negotiation is thought of as a dynamic process where the content and the structure of the dialogue changes according to the actions of the partners (Linnel, 1998 as cited in Rieber-Mohn, 2008), although there is no natural link between a linguistic utterance and its meaning. The meaning emerges from the dialogue and cannot be created by one party only (Lundqvist et al., 2013). Negotiation of meaning comes implicit when coining signs between people, as there is no possibility of shared meaning in a conversation without a dialogical view (Rieber-Mohn, 2008).

The process of creating symbolic tactile communication has been previously studied in people with Congenital Deafblindness by Forsgren (2016). He compared the creation of iconic signs in the visual and the tactile modalities. In his research, tactile

iconicity is explained by the tactile impressions being made from the form and function of an object when exploring it. The researcher found three stages in iconic sign creation: selection of tactile images or impressions, schematisation (choosing an image among others by the possibility of representation), and an encoding stage, where a tactile representation is created by a specific handshape, orientation, location, and movement(s), and according to the image selected in the first stage (Forsgren, 2019).

The current study intended to understand the process of coining tactile signs between a person with Acquired Deafblindness and his/her communication partner. Following from the results of Forsgren (2016), stages of tactile exploration, negotiation of meaning and encoding gestures were sought in the process. Also, an analysis of the coined tactile signs was complemented with a linguistic comparison with the visual signs from NZSL to understand a possible relation.

Research questions

The following main question was formulated: *How is the process of coining tactile signs/ gestures in the context of a guided experience?* The subsequent questions:

1. *Are there different stages to be recognized in the process of tactile sign creation?*
2. *What elements of tactile communication are identified in the final sign created?*
3. *Is there a change in the perception of tactile communication by the participants after the participation in the guided experience?*

Methods

The research had the particularity of being set up in the context of a global pandemic. To respect the Government of New Zealand advise, social distance between households was required. Utilizing online communication and video recordings as a tool, were necessary to visualize the progress of the intervention and analyze the process of coining tactile signs without direct contact with the participants. Given the difficulties of the pandemic context, the research was reduced to a case study.

Designed as a qualitative, descriptive, and comparative case study (Flick, 2014), an intervention was held by distance accompanied by a pre- and post- questionnaire. The intervention was presented with a guideline booklet, both in printed and digital version for accessibility. The guideline followed a similar pattern as the project of Landscape of Touch, taking the participants through six different activities of introduction to tactile communication (Tactile Communication Group DbI, 2012). The activities were progressive in complexity, leading to a final experience of coining their own tactile signs

for specific objects. The participants were requested to film themselves during this last experience and sent the recordings to the researcher for analysis.

The participants are described as: one person with ADB and his/her communication partner. Their relationship spans more than 40 years, and they preferably communicate through speech. The communication partner has no hearing or vision loss (Participant a), while the person with ADB identifies as a blind person (Participant b). Given the characteristics of the deafblind community in New Zealand and to preserve their confidentiality, no details are provided. They were selected from a group of people interested in tactile communication. With the requisites of having access to a computer, internet for the questionnaires, a screen reader software and a video recording device.

A pre-start questionnaire was developed inspired by the Deaf Acculturation Scale [DAS] (Maxwell-Mccaw & Zea, 2011), looking to understand the participants level of hearing and sight, as well as epidemiological and demographic information, identity, and experience with tactile communication.

After the intervention was completed, a second questionnaire was requested to be filled. This one included feedback on the accessibility of the guidelines and personal opinions on the possible use of tactile communication in their lives.

The intervention consisted of a series of activities self-paced, progressive, and guided through a booklet developed by the researcher. The guidelines were called *"Landscape of touch at home. An experience of tactile communication for people with Acquired Deafblindness and their communication partners"*. It consisted of six parts:

1) **Reflection**. Inviting the participants to imagine a landscape and reflect on the perspective of a person with DB and the perception they would have in that environment. The aim was to prompt the conversation, between the participants, about alternative ways to share outdoors.
2) **Film "Landscape of touch"**, created by DbI, Tactile Communication Group in 2012. The short film shows a diversity of people with DB in different communicative situations, always using the tactile sense. The film was accessible through audio description and subtitles.
3) **Hands over hands**. Presented an activity to understand the frame of talking hand over receiving hand, experiencing taking turns in a dialogue. This part also explained the concept of tactile cues or haptics with examples and inviting them to create and agree on their own.
4) **Discover a wall together**. After exploring a wall in the room, the participants were invited to recreate the shapes and forms found in it but through touch over their partners back. The aim was to expand the possibilities of haptic communication.

5) **Discover an object together**. Introduced exploration and recognition of household objects. This activity led the participants to describe their findings and together create a tactile sign that represents a chosen object.
6) **Creating tactile signs for given objects** (while video recording the process). Invited the participants to create their own tactile signs from three objects presented by the researcher. These objects were selected for their size, form, material, resistance, texture and possible function.

Figure 1

Image of the objects

Note. They are all palm hand size, left to right: silver metal spring, terracotta ceramic pot, green confetti popper with string hanging from the bottom

The recording included from the moment they open each object bag until the end of the activity, where all three tactile signs were created. The activity introduced the participants the chance of communicating through tactile signs without teaching them pre-existing signs but showing them the possibility of creating their own. After presenting different methods of tactile communication throughout the activities, this last one took them through the process of negotiation to agree on a tactile sign for each object.

Analysis

The video recording was transcribed with ELAN version 5.9 (computer software). ELAN is a program that enables video-annotation per video-frame dividing into different tiers or categories (Version 5.9; ELAN, 2020). The tiers selected were speech, exploration, and gestures, both for participant a and b (Pa / Pb). The tiers were essential indicators to find the possible stages in the process of coining. Speech referred to every vocal emission [Speech Pa/ Speech Pb]. Gestures were defined as hand movements that intended to express a message [Gestures Pa/ Gestures Pb]. Exploration was defined as the actions performed when examining the properties of an object [Exploration Pa/ Exploration Pb].

To be able to compare the process of creating each sign, the whole video recording was divided into segments. Each indicator was transcribed into a written document with annotations:

1. Speech was transcribed by listening and writing the content of the dialogue.
2. Gestures were transcribed by observing each individual frame and describing the hand movements involved.
3. Exploration was transcribed by identifying and coding with specific vocabulary based on the EPs.

The transcripts were used to create a graphic with the timeline and the indicators for better visualization of the stages. Each stage found was described and compared within the other segments for each object to find a possible pattern. The transcript of the dialogue allowed an analysis of the participation of each person and the indicators of negotiation of meaning (questions, responses, suggestions, agreements/ disagreements, repetitions, etc.). The exploration was transcribed using specific categories coding of exploration procedures [EPs]. The classification was created by Lederman & Klatzky in 1987 and amplified by Withagen et al. (2013). These last ones found five EPs most used for either sighted or blind people, both children and adults, to explore objects (Table 1.). Defined below, these are: Lateral motion, unsupported holding, enclosure, contour following and pressure. In addition, other hand movements or actions were identified in the tactile exploration from the same study. The use of hands has been identified as a fundamental tool for people with deafblindness, not only for perception but for reading gestures, signs, and words, and expressing (as cited in Lundqvist et al., 2013).

The transcript from the gestures was analyzed in segments of information selected then compared with the elements of the final tactile sign agreed. The tactile elements of every gesture made were identified and match with the different tactile communication methods experienced in the activities of the intervention.

Further on, the tactile signs coined were analyzed phonologically and compared with existing signs from NZSL for the same objects (Nelson Deaf Community, personal communication, March 30, 2020). The phonological elements of the sign were brought from linguistic analysis of visual sign languages. Based on the work of Stokoe (1960), these are identified as handshape, location and movement (Van der Kooij & Crasborn, 2016). Leaving behind the non- manual parameters of facial expressions and body posture, as they are perceived on vision. However, the researcher followed Mesch (2001) study on tactile sign languages and added a parameter called “tactile contact point”.

Finally, the effects of the study in the participants perception of tactile communication were analyzed from the answers in the questionnaires.

Table 1

Exploration procedures definitions and abbreviations

Exploratory Procedures	EPs	Definition
Lateral Motion	LM	The fingers are rubbed sideways on the surface of the object
Unsupported Holding	UH	The object is lifted away from any supportive surface and maintained in the hand without moulding the hand on it
Enclosure	EN	Both hands are put around the outer surface of the object
Contour Following	CF	This is a dynamic procedure where one or more fingers trace the contour of the object
Pressure	PR	Pressure is applied to any part of the object
Unclear	UC	Hands movements that showed undefined or unidentifiable behaviours
Other hand movements		
Throw Over	TO	Throw the object from one hand to the other, often repeated
Pick up and Drop	PD	Pick up the object with one hand and drop it on the other hand
Brief touch	BfT	While the object is lying on the extended hand, in the position UH. The object is touched softly and briefly
Examine features	EF	Clearly exploring features of the object in detail
Estimating Size	ES	Specific movements of hands and fingers with the goal of measuring size or distance
Global Perception of Shape	GP	Fingers go around the outline of the object to get an indication of shape. Differs from CF

Note. Taken from Withagen et al., 2013, p.1456-1457

Results

Different stages in the process of tactile sign creation

The analysis of the coining process showed three stages for each segment/object. These were identified as exploration, information selection and negotiation. Figures 2, 3 and 4 show the frequency of the indicators selected for the analysis (speech, exploration,

and gestures for each person's participation). The graphics were coded with “R.”, a software for statistical computing and graphics (R core team, 2013).

Figure 2

Segment for the object ‘spring’ (00:00.00 – 00:03.18 minutes)

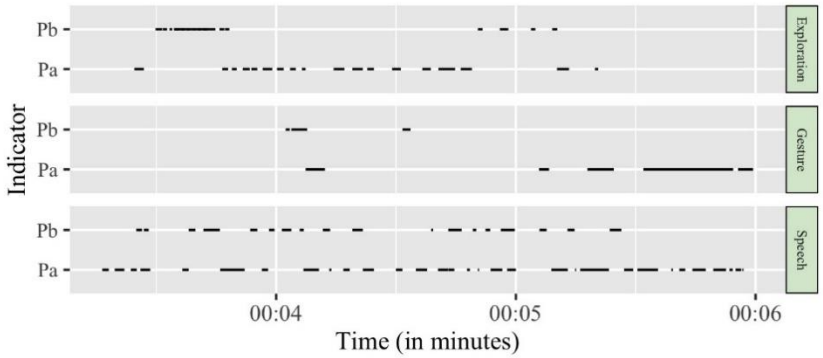


Figure 3

Segment for the object ‘pot’ (00:03.19 - 00:06.05 minutes)

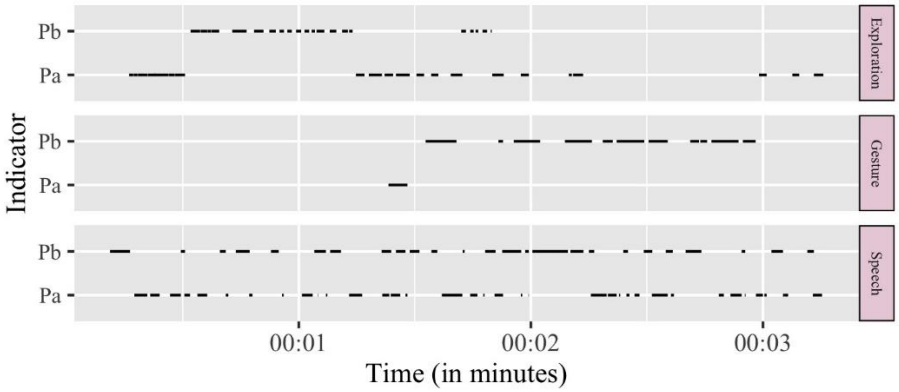
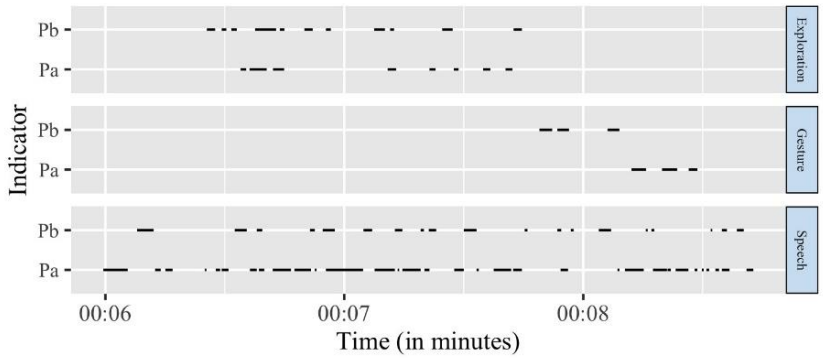


Figure 4

Segment for object ‘confetti popper’ (00:06.05 – 00:08.43 minutes)



The three segments represented showed the indicator of speech to appear alternating between the participants and throughout the duration of the activity. The exploration was broken down in different moments for each participant, as they

exchanged the object. For the first object, gestures were performed mainly by Participant b (person with ADB). Although, for the second object, exploration and gesture, showed a bigger participation of Participant a (sighted and hearing partner) with briefer participation of Participant b. The third segment was shorter than the others and particularly the gestures were minimal. While both exploration and speech had alternating features between the participants, speech appear throughout the segments.

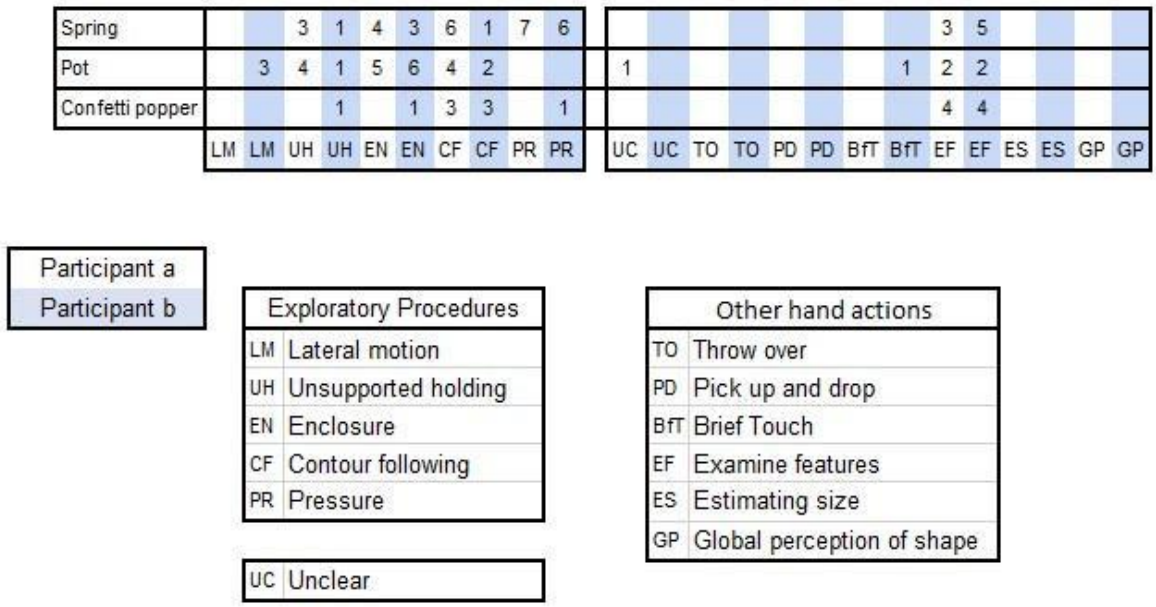
The process of coining a tactile sign was recognised as dynamic and progressive. Three stages can be found in all the segments: exploration, information selection and negotiation in different forms and blended during the activity, with no clear gap between them.

1) Indicators of *negotiation* were observed during the activity in the participants' speech and gestures (Figures 2, 3 and 4). The characteristics of the objects were discussed, trying different gestures while exchanging opinions. The dialogue had clear reciprocity, each participants shared their own thoughts and requested their partners' one. The collaboration between them was noticed in the feedback they gave to each other. Several indicators of the negotiation process were found in the observation analysis: a) Active participation from both participants, b) Clear turns between the participants (Figure 2, 3 and 4), c) Questions followed by answers, d) Agreements and disagreements, e) Request on thoughts of the other participant, f) Request for clarification.

2) The *exploration* was present at the beginning of each segment. It started as each object was placed in the hands of the participants, and finished after they recognized it, acknowledged its characteristic, and place it aside. Although, there were some opportunities where exploration restarted afterwards. In addition, Table 1 shows the exploratory procedures and hand actions used during the activity for each participant and each segment.

Figure 5

Exploration Procedures: Assess the frequency of the exploration procedures categorised by each object segment and each participant



The analysis showed that the five main exploratory procedures (EPs) were used repeatedly, while the hand actions were less used by both participants. However, the most used EP was 'examine features' (EF), defined to as a hand action in the literature (Withagen et al., 2013). The results throw that both participants used approximately the same amount of Eps repetitions (Pa=46, Pb=41), corresponding with Withagen et al. (2013) study where blind participants had more efficiency of hand movements for exploring and identifying objects characteristics. It was also found an outstanding decrease on the EPs repetitions in the last segment, also reaching the end of the intervention.

3) Information selection was found by focusing of the gestures made, as well as their verbal descriptions. The video analysis showed that the participants tried out different gestures in the process of coining. Each gesture had a connection with specific information of the object, either about the form or its function. The transcripts revealed that while gestures were made, the participants verbally described the information selected. The process was always the same: recognize the characteristics of the object, then select specific information with the goal of creating a tactile representation of it. Either information about the shape, the structure or the use of the object were used to try out different gestures and represent it in the tactile modality. The correlation between the information selected from the object during the tactile gesture creation and the information selected for the final tactile sign created is presented in Figure 6.

Figure 6

Examples of information selection

	Information selection - Example		Final sign
Spring	Shape	Name the object "spring"	Based on shape
	Features	"Can fit an index"/ "It's hollow"	
	Resistance	"It squashes"	
	Material	"It's hard material, ... wire"	
	Resistance	"if you squish, is very tough"	
	Functionality	"it bounces"	
	Shape	"it's a spiral, so round and round"	
Pot	Texture/ Shape	"It has a raspy sound, doesn't it?"	Based on shape and functionality
	Features/ functionality	"It has a little collar... and hole at the bottom to drain"	
	Functionality	"pot, plant"	
	Shape association	"cup"	
	Functionality	"something growing"	
	Functionality	"little flower"	
Confetti Popper	Number of objects	"There is two of them"..."the same"	Based on functionality
	Colour	"They are different colour"	
	Features	"It has a little string attached"	
	Shape association	"I have to say it is not a tampon"	
	Functionality	"you pull the string and paper shuts out"	
	Identification	Name of the object "party popper"	
	Features	"pulling out the cord"	

	Functionality association	"It is a happy occasion when you use it"	
	Functionality	"you pull the string and goes pop"	
	Functionality association	"happy sign, happy occasion"	

Note. For each object, information selected in the coining process and corresponding speech indicators, comparing with the information selected for the final tactile sign.

The analysis indicates that the form and the function of the three objects were explored. Characteristics and specific features were found and manifested to identify each object (Figure 6.), and both participants used similar strategies to identify the objects. They made associations with previous experiences with the same kind of object to verbally express the information found through their touch. Through negotiation of meaning, they decided to select information and tested on gestures, to finalise with a representation of the object in a tactile sign.

The graphics of timeline show that *exploration* and *information selection* stages overlap during the process of coining signs. The participants explored the object, selected the information, and tried out gestures, while they kept exploring to try out a different idea. In the same way, both *information selection* and *negotiation* were blended. While the participants tried out some gestures, they discussed their ideas and continuously gave feedback to their communication partner (Figure 2, 3 and 4).

Elements of tactile communication implicated in the final signs created

To understand the implications of the tactile communication involved in the activity, the process and the final tactile signs were analysed together. The timeline graphics showed that the exploration stage led to the information selection and testing different gestures between the participants (Figure 2, 3 and 4). These gestures were part of the process of coining signs, as a trial-and-error method.

For the three objects, the participants performed more than six trials of gestures in each segment. They integrate tactile drawing techniques, tactile cues, tactile iconic gestures as tactile communication elements. They also combined all methods until defining the final tactile signs with tactile drawing on the partner's hand. As a difference to the first two, the third sign evolve from a visual representation of the object. They tried different modifications to make the first gesture tactile, deciding on cues and haptics as a metaphoric sign.

In addition to the analysis of the coining process of tactile signs, these were compared to the existing NZSL signs via a phonological analysis. The linguistic elements were compared following the parameters selected for this research: handshape, location, orientation (hand or fingers), movement and contact point (for the tactile sign).

Table 2

Linguistic comparison for the spring final tactile sign and NZSL sign.

FINAL TACTILE SIGN		NZSL
		
Parameters	One hand sign	One hand sign
Handshape	Deictic, index finger pointing	Deictic, index finger pointing
Location	Upper torso	Upper torso
Orientation	Palm downwards	Palm upwards
Movement	circular	Path movement upwards + rotation of the writs.
Contact Point	back of the hand	

Note. Retrieved from NZSL dictionary (Victoria University of Wellington, 2020).

In the first comparison (Table 2), several similarities were found (marked with an arrow). The handshape used was the same for both signs (index finger). The location and orientation were similar, and the movement was almost identical, with the only difference that the coined tactile sign had constant contact during the motion. And they both intended to represent the shape of the object (Table 3).

Table 3

Linguistic comparison for the pot final tactile sign and NZSL sign

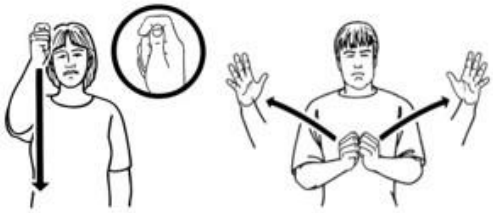
FINAL TACTILE SIGN			NZSL
			
Parameters	Left hand	Right hand	Both hands
Handshape	Cup hand	1st. fingers pointed together 2nd. five hand open fingers outwards	curve, fingers curled in
Location	upper torso	upper torso	upper torso
Orientation	palm inwards	palm outwards	both palms opposite each other
Movement	no movement	Open handshape: stretch fingers upwards	short path movement upwards
Contact Point	partner's palm	fingertips over partner's hand	

Note. Retrieved from NZSL dictionary (Victoria University of Wellington, 2020).

For the second object (Table 3), each signing mode presents different handshapes, but similar (curved fingers). Both resemble the shape of the original object (pot). While the tactile sign added the component of "growing" to the representation, the NZSL sign focused on the shape only (Table 3). On the same analysis, the movements were different for each signing mode, but both included an upward direction.

Table 4

Linguistic comparison for the confetti popper final tactile sign and NZSL sign

FINAL TACTILE SIGN			NZSL		
 					
			First		Second
Parameters	First	Second	Left hand	Right hand	Both hands
Handshape	five hand open fingers (both hands)	1st. fingers pointed together 2nd. five hand open	okay/ gripper	cup hand	1st. fingers pointed together 2nd. five hand open
Location	upper torso	upper torso	upper torso	upper torso	upper torso
Orientation	palms outwards	palms inwards	palms outwards	palm sideways	palms inwards
Movement	Path movement: clap repeatedly	Open handshape: spread fingers outwards	short movement downwards	no movement	Open handshape: spread fingers outwards
Contact Point	both sides of partner's right hand	fingertips over partner's hand			

Note. Retrieved from NZSL dictionary (Victoria University of Wellington, 2020).

For the third and last comparison (Table 4) both signs' modalities (tactile and visual) had a combination of two signs, while the second one matches in the two modes. Handshape, Location, and Orientation are the same, both representing the confetti papers blowing in the air when the object is activated (Table 4). The first part of the tactile sign differs completely from the NZSL part. The tactile sign has a repetitive path movement (clapping) while the NZSL sign has a short movement to represent the action of pulling the cord of the popper.

Overall, many similarities were found in the analysis between the tactile signs coined by the participants and the existing visual signs of NZSL for the same objects. Most matches were not exact but similar in handshapes and movements.

Perception of tactile communication evaluated after the intervention

The participants declared having some previous knowledge on tactile communication. In the pre-questionnaires, they affirmed that the hearing loss of the partner with ADB have had a big impact in their daily communication. However, this experience has shown to open their perspective on the possibilities of tactile communication beyond objects and labels in the house and reaching to an interpersonal tactile experience of communication (Table 5).

Table 5

Tactile communication perspectives

Participants perspective	**Pre-questionnaire**	**Post-questionnaire**
Definition of Tactile communication	"feel the interpreter" - "touching or holding items to gain necessary information"	"Conveying to a partner a message, a question, a comment, a command, etc. without verbal of sight senses being required" "It means using a sign using hands, usually felt by a communication partner"
Possible uses of Tactile communication	"help my partner with the location of tactile dots on kitchen utilities" "use tactile bumps on household utilities and braille labels"	"it could be used to communicate in private when other people are around, or in a noisy environment where there is difficulty hearing"

Note. A comparison for the definition and possible uses of tactile communication between the pre- and post- questionnaires.

The analysis of the questionnaires showed that, after the intervention, their appreciation for tactile communication was related to their hearing challenges. They linked the difficulties of communicating outdoors and in loud environments, with the possibility of communicating through tactile signs.

The participants manifested to have enjoyed the process, regarding the challenges involved in it, such as accessibility and lack of creativity. Some activities were found easier than others, discovering the wall and an object were found easier than learning “hands over hands” communication and creating tactile signs. Despite these challenges, the participants concluded that tactile cues or haptic signs can become part of their daily life.

Discussion

Conclusion

The research has demonstrated there are three stages in the process of coining tactile signs. The participants went through the same process for every object. The stages found were identified as dynamic and overlapping during the coining process.

Firstly, negotiation of meaning was found throughout the whole process, in their speech and gestures. To continue, a stage of exploration was found to be important to the creation of new signs. The analysis showed that the final tactile signs were directly related to the procedures used to explore the objects. Both participants utilised the main Eps. A third stage of information selection was found to follow the exploration stage, by identifying the characteristics of the object. There was a correlation between the information selected (tried on gestures and verbal description) and the nature of the final tactile signs created .

The final tactile signs were decomposed on their linguistic elements and compared with their NZSL existing signs. Several similarities were found in the parameters Handshape, Movement, and Location for the newly coined signs and their NZSL counterparts.

To finalise, the process of coining tactile signs resulted in an interesting experience for the participants, giving them the desire of learning more about tactile communication and possibly introducing haptic signs to their daily repertoire.

Discussion

The correlations done in the analysis, showed that the process of coining signs became naturally to the participants, even without previous experience. Every stage was connected to the previous and the following stage. Coining signs for a specific object involved exploration and identification of the object; information selected from the same and tactile gestures tested. And through negotiation of meaning these gestures evolved into a particular tactile sign coined by the participants.

Coining tactile signs was the result of a learning process, integrating tactile communication methods from the intervention proposed. There were elements of tactile communication from the intervention in the final signs created. Surprisingly, the final

tactile signs created showed several formal similarities with the NZSL linguistic signs . The results revealed that the signs overlap in (part of) their form, showing iconicity as part of the elements. Tactile iconicity relies on bodily tactile traces felt by the signing person (Forsgren, 2016). This means that the participants' coining was directly connected with their tactile perception. The correlation between the analysis of the exploration procedures and the information selection reveals that tactile exploration does not depend on vision or hearing. Like previous studies stated: "… the presence of visual abilities is apparently not a necessary condition for developing and conducting specific EPs." (Withagen et al., 2013, p. 1462). The decrease on the EPs repetitions in the last segment can relate to the end of the intervention, possible tiredness. However, this can also relate to the finding of Withagen et al. (2013), where repetition of the task improved the efficiency of the exploration.

Overall, the research had a positive effect in the participants regarding their knowledge on tactile communication. They expand their possibilities and include tactile communication as an alternative for their daily life. Their participation can be seen as an example of a natural process of gesturing to communicate. Gestures, and tactile gestures appear naturally for all humans (Kendon, 1997). Among Deaf people, gesture systems develop into sign languages over time (Edwards, 2014). This research approached the creation of tactile gestures when there is a bridge of tactile communication between people with ADB and with their communication partners.

Limitations

This research was designed as a case study. Therefore, no generalisations can be made regarding coining tactile signs. The signs created by the participants cannot be treated as part of the New Zealand Sign Language tactile version. As shown by Edwards (2014), tactile sign languages are more than a bodily-tactile mode of visual sign languages. They should be treated like its own language system with its own grammar. The mayor limitations on this study were found in the accessibility of the intervention. Access to technology limited the possibilities for other possible participants. Some activities in the intervention guideline were found challenging for the participants with ADB. These were: selecting audio description on the film, reading the guidelines on PDF format (screen readers work more efficient with .doc format), follow the guidelines while performing the activities and sending the video-record to the researcher. These challenges could not have been overcome without the help of the communication partner.

Implications for pedagogical practice

The results of this study can work as a learning point for educators setting up their practices. By understanding the coining process, they can learn what to expect in every

stage (exploration, information selection and negotiation) and adapt the intervention to fit their context. It is recommended to use video analysis as a tool to observe the details in the hand movements. Negotiation of meaning is important for all types of communication, but educators and support workers need special reflection on this matter. Because deafblindness presents as a communication challenge, affecting interpersonal relationships, without negotiation of meaning, communication cannot be dialogical (Nafstad & Rødbroe, 2015).

The intervention presented in this study can also be used as a manual for communication partners (family members/ neighbours/ support workers) of people with deafblindness, either congenital or acquired. And the questionnaires could be used (with the right modifications) to evaluate the learning process of the intervention. This intervention can be used with people with ADB, either from the blind or the deaf community while adjusting the intervention and questionnaires design to their primary language (spoken or sign).

Implications for further research

This research can be performed with a wider scope of participants with similar characteristics (with changes in the accessibility of the intervention). It can involve residential homes for the elderly, as the probabilities of some type of deafblindness are higher (Rødbroe & Janssen, 2006).

Advise for further studies is to focus on investigate deeper in the benefits of introducing social haptic communication for people with ADB that preferable communicate through speech. Haptics were studied to work as a support system for spoken or signed language (Lahtinen, 2008). It was found that the participants enjoyed this element of tactile communication, as well as introduced it in their final tactile signs.

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