The Readability of Language: Observing the Non-Linguistic and Linguistic Features in the Communication of a Child with Congenital Deafblindness

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Abstract

Children with congenital deafblindness (CDB) have, similar as deaf and hearing children, an innate ability to acquire a language. It is known to be a challenge for children with CDB to acquire a first language. Most children with CDB do not learn to speak or sign and remain at a pre-linguistic level of language development. Observing non-linguistic and linguistic features is essential for pre-linguistic and early linguistic language development. This study used a systematic observation instrument to observe the non-linguistic and linguistic features of a child with CDB. The case study resulted in a qualitative analysis of communicative expressions and signs made by the child with CDB. BET's and gestures were expressed consistently and correctly in the context of the communication. The linguistic features of the signs expressed by the child did not match the features used in the conventional signs. Also, the child produced different phonological forms of one particular sign, making the signs of the child inconsistent. We discussed that inconsistent signs can lead to difficulty with the signs by the communication partner. Difficulty with readability of signs of the child by the communication partner may negatively influence the language development of the child. Different possible causes of the incorrect and inconsistent signs of the child were discussed, such as the inability of the child with CDB to access the linguistic features of the communication of the communication partner. Recommendations were given to support the language acquisition of children with CDB. Also, recommendations were given for further research.

Keywords

deafblindness, dual sensory loss, sign language, tactile communication, linguistics

Introduction

Bloom & Lahey (1978) define language as a code through which ideas about the world are represented. Language consists of a conventional system of arbitrary communication codes, containing three components: form, content, and use (Bloom & Lahey, 1978). *Form* is the language structure used to communicate a message (phonology, morphology, and syntax). Form consists of small meaningful elements (linguistic features), and combined, these elements create a word or sign. For example, the sign 'MOM' in Sign Language of the Netherlands (Nederlandse Gebarentaal, hereafter NGT) consists of the three phonological features handshape (ⓜ), location (cheek), and movement (double tap). Comparing minimal pars will determine the linguistic features of a language. For example, the signs 'MOM' and 'DAY' are located on the cheek but differ in handshape ⓜ or **1** (Braad, 2021). These different handshapes give different meanings to the sign, making the handshapes linguistic features. Signs, words, and sentences are created when different linguistic features are combined. Language content "refers to the message or meaning that is communicated (semantics)" (Bloom & Lahey, 1978; Braad, 2021, p.6.). The pragmatics of a language (*use)* refers to the *functions* a language has in different *contexts.* For example: asking a question in a specific context (Bloom & Lahey, 1980). "Language development involves learning the *use* of linguistic *forms* that encode elements of *content* for different purposes in different situations" (Bloom & Lahey, 1980, p.123).

Figure 1

Model of language: form, use and content (Learning Disabilities Coalition, 2018)
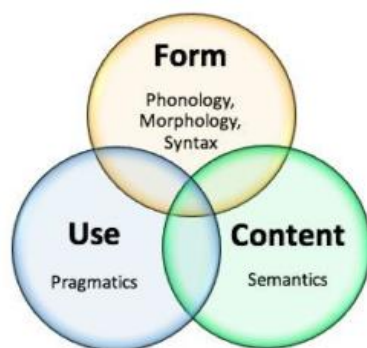
Note. Based on figure 4 from Bloom & Lahey (1978).

All children, deafblind, deaf or hearing, have an innate ability to develop or acquire a language (Baker et al., 2008; Nicholas, 2013; Ivanova, 2019a). Persons with congenital deafblindness (hereafter CDB) have a combined vision and hearing impairment from birth or before language acquisition begins (Nordic Welfare Centre, 2018; Heppe et al., 2021). Most children with CDB do not learn to sign or speak, and they remain at a pre-linguistic level of language development (Bruce, 2005; Vervloed & Damen, 2016).

To acquire a language, language input from birth is essential. Parents speak or sign to their baby from the moment it is born. The first phase of language acquisition is the pre-linguistic stage when the child does not sign or speak yet. In this phase, the child and parents communicate through non-linguistic features: eye contact, eye gaze direction, facial expressions, body and head posture, gestures, and touch (Baker et al., 2016; Schaerlaekens, 2016). Non-linguistic communication consists of meaningful elements or features, just like linguistic features. Expressions consist of different non-linguistic features, giving the expressions a set meaning. When a child waves and smiles it has another meaning than when the child only smiles. The communicative expressions are not arbitrary and do not consist of minimal pairs; thus, the features are non-linguistic. In the pre-linguistic stage of language development, the child tries to imitate the facial and mouth expressions of the communication partner. The adult observes the expressions and movements of the child and reacts to them. This leads to a proto-conversation where both the child and the parent take turns reacting to each other's non-linguistic expressions (Baker et al., 2016). By imitating the communicative expressions of their parents, children will also (try to) master the signed or spoken language. (Baker et al., 2016; Schaerlaekens, 2016). Between the age of one and two-and-a-half years, the typical child begins to produce referential signs or words and enters the early-linguistic stage of language development (Schaerlaekens, 2016). Words or signs have a conventional form and a fixed meaning. In the early-linguistic stage of language development, the child has learned content is expressed in a form, which is used in different context with different persons. (Braad, 2021, p.8). Due to standard phonological processes in language development, the child form of a particular sign or word differs from the adult form; for instance, the child substitutes complex features with simpler ones (Braad, 2021). Due to variety in articulation, children are only intelligible once phonological development is complete. Before that, it may be challenging, especially for communication partners who do not know the context of the child, to understand them (Schaerlaekens, 2016). Once the child combines two words in a specific order, syntax development begins. As children improve their motor skills to express language, phonological errors are still made. In the early-linguistic stage of language development, parents learn to recognize the language forms of a child. By responding with the appropriate meaning and form, the parents reaffirm to the child that each form has a specific meaning and can be used in different contexts.. The differentiation stage, in typical children seen from the age of 2;6 until 5;0, is the stage of language development where the language of the child becomes more complex and the

production of grammatical structures starts (Schaerlaekens, 2016; Baker et al., 2016). The child can refer to objects, persons, and events outside the here-and-now in a grammatically correct way, and the pragmatic skills of the child improve (Baker et al., 2016).

As stated before, most children with CDB remain at a pre-linguistic level of language development where the child does not sign or speak yet (Bruce, 2005; Vervloed & Damen, 2016). From the perspective of language development, there are various possible reasons for this delayed language development, two of them being accessibility and readability. Deaf and hearing children acquire language similarly if they receive language accessible to their sensory abilities (Baker et al., 2016). The acquisition of a first language depends on the amount of language input a child receives and when the language input begins (Baker et al., 2016; Schaerlaekens, 2016). Language input in the sensory modality the child can access, offered directly after birth, is a prerequisite for language development (Braad, 2021).

Vervloed & Damen (2016) describe that people with deafblindness receive language through different modalities, depending on the degree of functional vision and hearing. Ask Larsen (2015) concluded that the absence of language expressions of people with CDB was not related to the severity of their sensory abilities or their intellectual capabilities, but related to the lack of access to language that is adapted to their sensory abilities. A bodily tactile language is likely the natural language of people with CDB (Dammeyer et al., 2015; Forsgren, 2016). Bodily tactile language refers to a new, culturally not yet established language that originates in the bodily tactile expressions of people with CDB (Braad, 2021). This study will address bodily tactile language as bodily tactile communication because the expressions are not yet developed into an arbitrary conventional and cultural language. Dammeyer et al. (2015) and Forsgren (2016) found that features used by people with CDB differ from linguistic features of signed or spoken languages. Persons with deafblindness adjust the tactile sign language to their sensory abilities (Forsgren, 2016). Forsgren (2016) concluded that the signs originate from their bodily tactile perception. Dammeyer et al. (2015) conclude that the linguistic features of bodily tactile language are distinct from sign language. These distinct language expressions could lead to low language readability of persons with CDB.

Low readability is a characteristic of people with CDB (Nafstad & Rødbroe, 2015). It is difficult to understand or notice the signals of a person with deafblindness. The expressions of a person with deafblindness are slower, more subtle, and more difficult to predict than those of sighted and hearing persons (Janssen & Rødbroe, 2007). Therefore, often the expressions are not recognized (Janssen & Damen, 2018). It is crucial for pre-linguistic development that non-linguistic expressions of children with CDB are recognized and responded to, leading to proto-conversation. For proceeding to the early-linguistic stage of development, linguistic forms of expressions of the child with CDB must be recognized. By responding to these linguistic expressions, the communication partner

reaffirms to the child with CDB that forms have a specific meaning and can be used in different contexts.

This study aims to research the readability of non-linguistic and linguistic features in the communication of a child with CDB by using a systematic observational instrument to observe these features. The main research question of this study is: what non-linguistic and linguistic features are observed in the communication of a person with CDB? The sub-questions are: 1) are the non-linguistic features of expressions communicated correctly and consistently by the child with CDB? and 2) are the linguistic features of a sign with the same meaning expressed correctly and consistently by the child with CDB?

Methods

Study design

An observation instrument for non-linguistic and linguistic features was developed (Braad, 2021) and applied to observe the communication and language of a single child with CDB. The non-linguistic and linguistic features were transcribed, annotated and qualitatively analyzed.

Participants

The case study participants are a child with CDB named Charlie (pseudonym) and his teacher. Charlie is a 8;9-year-old boy with CHARGE syndrome and profound deafness. Charlie has some residual hearing with which he can detect sound but cannot give meaning to the sounds. He is functionally deaf. Charlie has a cochlear implant (CI) in his right ear, which he received when he was 1,5 years old. Because of medical issues, he was not wearing the CI at the time of the filming. The boy his visual acuity was between 0.2 and 0.32 for both eyes. Characteristics of a visual information processing deficit are observed, namely problems with dividing visual attention, inconsistent visual functioning, focusing on light sources, and more visual attention toward colors and light sources. The communication partner is a teacher who has been working with children with deafblindness for four years and has known Charlie for 2,5 years (Braad, 2021).

Observation procedure

The communication between the two participants was filmed in the classroom, where three other children and an assistant teacher were present. The recording was made as part of the PhD study '*Tell it! Supporting bodily-tactile communication, language and self-determination*' (Damen, 2019). The parents of Charlie gave consent to use the video for current research and this article (Braad, 2021).

The observation instrument

The instrument consists of eleven categories used to observe non-linguistic and linguistic features in the communication of a child with CDB. Each category consists of the corresponding non-linguistic or linguistic features and a definition and example of each feature. For an overview and a description of the instrument, see Braad (2021).

Transcription, annotation and analysis

The filmed conversation of 21 minutes was transcribed and annotated with EUDICO Linguistic Annotator, hereafter ELAN (Max Planck Institute for Psycholinguistics, 2020). A qualitative analysis was conducted of the non-linguistic and linguistic features produced by the child with CDB. Non-linguistic communicative expressions were coded for correct or incorrect use within the context and whether these expressions were produced consistently in the same form. Linguistic expressions (signs) were coded for correct or incorrect articulation and whether these signs were produced consistently in the same form. For example: were the signs 'WALK' consistently expressed using the same linguistic features, or did the child produce the signs 'WALK' using different linguistic features? Different forms of a sign were analyzed, looking at the features the child produced (Braad, 2021).

Results

Non-linguistic features

This section describes a qualitative analysis of the non-linguistic expressions of Charlie.

The direction of Charlie his eye gaze in communicative expressions was used correctly and consistently. His eye gaze direction was focused on the signs made by his teacher, the teacher's eyes, the teacher's mouth, face, and light sources. Charlie also looked at objects while communicating with his teacher. Most of the time he followed the teacher's 'pointing sign' and looked at the object the teacher pointed to. Charlie his eyes were directed at an object, pushing his teacher's hands toward this object. There was shared attention between Charlie and his teacher when their eye gaze was focused on an object, such as his plan book. (Braad, 2021). Charlie used body contact consistently and correctly to communicate. He communicated 'stop signing' by pushing the hands of the teacher down into their laps. Charlie communicated 'red' by touching a red object with his lips. Also, he communicated 'grab bag' by pushing the left hand of his teacher towards the bag.

Charlie expressed a slight head movement 'no' several times. The facial expressions shown by Charlie were frowned eyebrows, yawn, squeezed eyes, and a smile. Overall, his facial expressions were inconsistent and incorrectly expressed. Charlie frowned his

eyebrows and squeezed his eyes in various contexts. For example, he frowned his eyebrows when the teacher was signing, when he shook his head 'no', when he signed, and when his eye gaze was directed at the teacher's eyes. It is unclear if Charlie used these facial expressions to communicate or if these expressions had no communicative intention. The only facial expression used correctly within specific conversation contexts was 'smile' (Braad, 2021). Charlie used different gestures consistent and correct to communicate, such as point touching (pointing by touching) the nail polish on the nail of the teacher to communicate 'nail polish'. Also, he communicated 'grab bag' by putting his hands towards the bag. Charlie communicated correctly and consistently using BET's. He expressed 'walking' by moving his legs and 'nail polish' by moving his middle finger over his index finger (Braad, 2021).

Linguistic features

Charlie produced the signs 'BAG', 'CANNOT?', 'CANNOT', 'EAT??', 'GRAB OBJECT', 'HELLO CAMERAMAN??', 'HELLO TEACHER?', 'I THINK', 'ANGRY', 'PLAN', 'WALK?', 'WALK'. Signs that Charlie mainly produced were 'WALK' and 'CANNOT'. Signs with one question mark meant that the sign was not directed at the teacher, or the meaning did not fit in the context. Two question marks were used when it was unclear if the movement was intentional or just a movement (Braad, 2021). Also, Charlie had his thumb and index finger of his right hand in his mouth for almost the entire conversation, which was interpreted as a consolation gesture (like thumb sucking seen in the behaviour of small children) (Braad, 2021).

In the next section, a qualitative analysis of the signs is described, following the categories of the instrument.

In category two, touch, he signed 'I THINK' by touching his head on the left side with his right hand. The sign was not produced correctly compared to the conventional sign. Also, the sign was produced in two different ways, making it inconsistent. Charlie made a C next to his head, put his thumb on his eyelid, and his index finger was on the left side of his head. Charlie expressed, 'HELLO CAMERAMAN?'. He moved an AS-hand to the back of his head twice. The conventional sign 'HELLO' is composed of the same arm movement as Charlie his arm movement. The conventional sign differs from the sign of Charlie regarding handshape, as the conventional sign is a 5 handshape. The location where the sign is made by Charlie also differs from the conventional sign. These two features are different compared to the conventional sign, making it difficult to read the sign of Charlie as 'HELLO'. Once, Charlie took the hands of his teacher and manipulated them into two AS-hands, expressing 'ANGRY'.

No features were observed in category three, the whole body.

In category four, handshape, Charlie made various handshapes, such as: AS-hand (left or right hand), C with left hand, L with right or left hand and 5 claw (left or right hand). For other handshapes, see Appendix A. The most handshapes produced by Charlie were expressed in the signs 'WALK' and 'I THINK'. The sign 'WALK' was produced incorrectly

compared to the conventional sign. Charlie signed 'WALK' with four handshapes: 1) 5-claw, 2) X2-handshape, 3) 5-claw with his ring and middle finger oriented towards his palm, 4) a baby C with spread fingers with his right hand. 'THINK' was also made incorrect and inconsistent. Charlie used alternately C-closed, L, 5, C handshapes. Charlie only expressed two-handed signs with the teacher's hands to say 'CANNOT'. He only expressed one-handed signs with his own hands.

In category five, orientation, Charlie oriented his fingers, hands and upper body. The most used orientations by Charlie were the palm of his hand forward or upward. Producing the sign, 'I THINK' his palm was oriented incorrectly and inconsistent. In the conventional sign of 'I THINK', the hand is oriented 'back of hand upward', and Charlie oriented his hand 'back of hand half up' or 'palm facing upward'. Charlie oriented his fingers towards an object, upward or towards himself. His teacher put his index fingers in an upward position, creating the sign 'CANNOT'. Charlie did not put his fingers in this position himself. The teacher modelled the sign 'PLAN', positioning his hands in a 5-claw. Charlie tried to make the sign 'WALK', moving his hand back to front from his wrist, orienting his fingers towards himself. This is incorrect in comparison to the conventional sign.

In category six, location, Charlie used the space around his body, locations on his head, and the left hand of his teacher. He made the sign 'I THINK' incorrectly compared to the conventional sign, locating the sign on the left side of his head, in the space next to his head and putting his thumb on his eyelid. Charlie expressed the sign 'EAT' by putting his hand inside his mouth. The conventional sign is made under the lower lip, making the location of the sign 'EAT' made by Charlie incorrect. Charlie did not use the space in front of his body himself, but he used this space when the teacher modelled the sign 'CANNOT' with his hands.

In category seven, movement, Charlie moved his hand, fingers, head and arm. Charlie repeated movements two or three times. Charlie expressed 'CANNOT' with the teacher's hands by putting his hands around the teacher's left and right index finger and moving them from the middle to the outside to express 'CANNOT'. This movement was correct compared to the conventional sign 'CANNOT'. The finger movements in the sign 'WALK' were made incorrect and inconsistent in six ways. Charlie opened and closed his fingers when he signed 'GRAB BAG' or 'BAG'. Charlie correctly moved his arms when signing 'CANNOT'. He moved his arms from the middle towards the outside.

In category eight, the non-manual features, Charlie showed various facial expressions. These various facial expressions were made as part of a sign, meaning they are linguistic features. During the signing of 'HELLO TEACHER', 'I THINK', and 'WALK', he frowned his eyebrows. Frowned eyebrows are not part of the conventional signs 'WALK' and 'I THINK', making the expressions of Charlie incorrect. Also, the raised eyebrows were inconsistent in these signs. With the signs 'HELLO CAMERAMAN??' and 'WALK' Charlie had a grimace.

In category nine, morphology, no linguistic features were observed. Moving his hand on the back of his head and sweeping it forward again, Charlie expressed 'HELLO CAMERAMAN??'in a hard manner, which is not a feature of the conventional sign 'HELLO'.

In category ten, word classes, different lexical classes were observed in the language of Charlie, such as adjectives, nouns, and non-congruent verbs.
In category eleven, syntax, Charlie constructed sentences with the adverb 'CANNOT', a non-congruent verb 'I THINK', a pronoun, and transitive verbs.

Discussion

An attempt was made to assess the readability of the communicative and language expressions of a child with CDB. An observation instrument was developed (Braad, 2021) and used to annotate and transcribe the non-linguistic and linguistic features, assessing these features qualitatively. Firstly, the study's conclusion will be discussed, followed by the limitations, a discussion of the results and recommendations for further research.

Conclusion

The child expressed the following non-linguistic features: eye gaze direction, body contact, head movement, facial expressions, gestures and BET's (Braad, 2021). Eye gaze direction, body contact, and head movement were consistent and correctly communicated to the communication partner. The eye gaze direction 'light source' interrupted the communication and was incorrectly used within the context. The head movement 'no' was slight, possibly making it hard to recognize. The child with CDB used facial expressions inconsistently and incorrectly, making it challenging to recognize and give meaning to these expressions. The facial expression 'smile' was used consistently and correctly, making it possible to recognize this expression. The gestures and BET's used by the child with CDB were correctly used in the context of the communication (Braad, 2021).

The linguistic features expressed by the child with CDB are touching the body, duration of touch, various handshapes, the orientation of the hand, fingers and upper body, location on the head, hand, in free space, movement of the arm, head, hand, fingers, repeating movement, facial expressions, manner, various lexical classes and agreement (Braad, 2021).

The qualitative analysis of the linguistic features in signs made by the child shows that the signs of the child did not match the features used in the conventional signs. The child his signs were incorrect compared to conventional signs. Also, the signs were inconsistent, and the child produced different phonological forms of signs with the same meaning. Different linguistic features for signs with the same meaning would make it challenging to recognize these signs. Multiple features of a sign were made incorrect, making it difficult to recognize the sign (Braad, 2021).

Limitations of the study

The observation was done following the 11 categories of the instrument. This turned out to be impractical for conducting a qualitative analysis. The instrument should be used with a non-linguistic or a linguistic expression as a starting point and assess the eleven categories to arrive at an overview of a qualitative analysis of the specific expressions or signs (in comparison to current results, an overview of features per category). During the study one communication moment of a child with CDB was researched. As a result, the study cannot be generalized to reflect the entire population. The study should be repeated with a larger population of children with CDB. One assessor conducted the current study. As a result, validity and reliability are not measured.. The results of the current study encourage replicating the study with a larger population and multiple assessors to establish the readability of signs made by children with CDB. In further research, the expressions of the communication partner should also be observed to assess whether the communication partner responded to the expressions of the child. If the communication partner repeats the expressions of the child, this determines the readability of the expressions of the child with CDB, as the expressions are acknowledged or not. In the current study the expressions of the communication partner were not observed and therefore it could not be determined if the communication partner recognized and read Charlie his signs and if there was, in fact, a low readability (Braad, 2021). Linguistic expressions of children should be acknowledged in the pre-linguistic stage of language development (Schaerlaekens, 2016; Baker et al., 2016) by responding with the correct sign. By responding with the correct sign, the child learns that form has a set meaning within a specific context (Baker et al., 2016). It is recommended to annotate and transcribe the non-linguistic and linguistic features of the expressions of the partner to establish if the communication partner acknowledges the non-linguistic and linguistic features of the child with CDB. This could determine which expressions (non-linguistic or linguistic) are or are not acknowledged or interpreted correctly (Braad, 2021). Observing if the communication partner can recognize and interpret the (non-linguistic or linguistic) expressions correctly can be used to measure the effectiveness of an intervention.

As for The results show that Charlie produced both non-linguistic and linguistic features. In the non-linguistic features, Charlie expressed 'no' with a tiny head movement, and his facial expressions were not correctly and consistently used. In particular, the feature 'raised eyebrows' was not used within the right context and was used inconsistently. The communication partner might not read the 'raised eyebrows' as a communicative expression or might not even observe them, missing an opportunity to imitate them and establish proto-conversation. The non-linguistic facial expressions of Charlie correspond to previous studies that described expressions as slower, subtler and more difficult to read (Janssen & Rødbroe, 2007) or as low readable (Nafstad & Rødbroe, 2015). . BET's and gestures of Charlie are readable because they are expressed correctly

and consistently. The communication partner should also imitate these expressions, creating a proto-conversation (Baker et al., 2016; Schaerlaekens, 2016). Creating a proto-conversation of BET's and gestures gives the person with CDB the opportunity to develop these expressions into expressions with a fixed meaning, which is seen in the phase of language development where children babble and parents respond with a fixed meaning (Baker et al., 2016; Schaerlaekens, 2016). The child with CDB will learn that forms of the BET's and gestures are connected to a specific meaning within a specific context (Bloom & Lahey, 1978). The communication of Charlie using his eye gaze direction was correct and consistent. 'Light source' was the only eye gaze direction without clear meaning in the context of the communication. This eye gaze direction could be a consequence of CHARGE syndrome. Charlie is known to have characteristics of a visual information processing deficit and is focused on light sources (see methods section).

As for the linguistic features, signs expressed by Charlie are distinct from the conventional signs in NGT. Charlie incorrectly expressed linguistic features of the parameters handshape, orientation, location and movement. Also, the forms of signs with the same meaning varied, which might make recognizing these signs harder. The distinct signs of Charlie are consistent with the other studies. Dammeyer et al. (2015) and Forsgren (2016) describe that the signs expressed by children with CDB differ from conventional signs.

In language acquisition, a child substitutes linguistic features for other features, and these phonological processes are part of typical language acquisition (Schaerlaekens, 2016). Deaf children, therefore, make substitutions in handshape, movement, and location when acquiring sign language (Baker et al., 2016). Based on this study, it cannot be determined if the incorrect features expressed by Charlie are due to phonological processes, seen in language acquisition (Schaerlaekens, 2016). Or that Charlie cannot express some non-linguistic and linguistic features due to inhibited motor skills. Another plausible explanation is that Charlie cannot access or receive various non-linguistic and linguistic features, making it impossible for him to imitate them. Deaf children can only acquire a first language similarly to hearing children if language is accessible to their sensory abilities (Baker et al.). Language input in the sensory modality the child can access, offered directly after birth, is a prerequisite for language development (Braad, 2021). As the child imitates his communication partner's linguistic expressions to develop a language (Baker et al., 2016; Schaerlaekens, 2016), it is possible that the readability of the language expressed by the child with CDB depends on the access to language input. This advocates exploring the most accessible language for individuals with deafblindness. Since tactile perception is the best functioning sense, this seems to be the most accessible form of language (Dammeyer et al., 2015; Forsgren, 2016), leading to typical language development (Baker et al., 2016; Schaerlaekens, 2015).

Tactile sign language originates from visual sign language and is communicated by placing the hands of the listener on top of the signer (Edwards & Brentari, 2020). Reed et

al. (1995) determined that tactile sign language is received only with 60-85% accuracy by people with deafblindness, meaning that 15-40% of tactile sign language is received inaccurately. The largest source of errors was inaccuracies in the reception of the phonological parameters of the sign language (Reed et al., 1995). Therefore, incorrectly expressed features by Charlie could result from errors in the accuracy of the reception of the phonological parameters. This prompts the search for a conventionalized tactile language input, such as pro-tactile language (Edwards & Brentari, 2020). The study of Edwards & Brentari (2020) describes the phonological patterns that emerge in a subgroup of deafblind signers in the Seattle community, who communicate via reciprocal, tactile channels. This practice is called 'pro-tactile' (Clark, 2017a; Granda & Nuccio, 2018). Edwards & Brentari (2020) describe how phonology becomes conventional among a group of deafblind signers and how form and content are linked (Bloom & Lahey, 1978). It should be researched if pro-tactile language input will lead to more language expressions by the child with CDB and if the readability of the language expressions of the child improves. As the pro-tactile language becomes conventional, this has significant advantages for the readability of the language expressions of the child throughout his life, given that conventional language is better known by people than individual expressions of a child with CDB, such as BET's. Also, pro-tactile language will give the child the amount of language input it needs to acquire a first language fully. More language input leads to more means to express various content, make two-word sentences and enter the differentiation stage of language development (Baker et al., 2016). First, a (pro-)tactile language should be culturally established within the deafblind community, as the intuitions of people with deafblindness about tactile communication are stronger than the intuitions of people with vision (Clark, 2017b).

Research should focus on language access and the effect on the readability of the language expressions of the child. Language should be observed over extended periods, measuring the extent to which the child imitates the given language input (signs, spoken or pro-tactile). Further research should focus on the variations of forms made by persons with CDB. It should be researched if typical patterns arise and if this sheds light on the cause of the incorrect forms. Also, interventions to support children with CDB to produce the correct sign should be studied. Specific target signs can be used to research short-term interventions. The communication partner should acknowledge the phonological varieties of a sign to enter the early-linguistic stage of language development (Baker et al., 2016). Tactile support should be given to the child with CDB to produce the right linguistic features of a sign. In communicative situations the communication partner should connect language content (tactile semantic information) to language form (linguistic features), as seen in pre-linguistic stage of language development (Baker et al., 2016).

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You can find the appendix here: <https://jdbsc.rug.nl/article/view/40014/36593>

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