Towards a renewed Braille Pedagogy

Essay for the Albanian Braille Alphabet

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Being Thankful to God

For guiding and supporting me

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Abstract

The current paper looks for possible ways to facilitate the encoding and the memorization of individual Braille characters alone, as well as couplets of related Braille characters, which share common attributes or the dot configuration of which is related according to different distinct criteria of grouping, namely the kinaesthetic criterion, the criterion of complementarity and for older students of the 4th grade onwards, the criterion of vertical symmetry. If blind children know that two Braille characters are related, according to a given criterion of grouping, and the dot configuration or the motor scheme of one of them, consisting of the set of fingerings employed in order to type this character on the Perkins Brailler, is familiar to them, then they may derive either the dot configuration or the motor scheme of the unknown Braille character by applying certain rules of transformation on the dot configuration or to the motor scheme respectively of the known Braille character, with which the not yet mastered Braille character is related according to a given criterion of grouping. The aim is forging links ***between two or more Braille characters in order to facilitate the encoding and memorization of a newly introduced Braille character on the basis of an already known one. By following this approach, a*** complex network of interrelationships between Braille characters may be created in the mind of any given blind child. Blind children may consolidate the motor scheme of any given Braille character by accommodating the motor scheme of another Braille character, known to him/her, to which the former is related according to a given criterion of grouping. In addition, interrelationships in the motor schemata of two related Braille characters according to a given criterion of grouping may be highlighted aurally by juxtaposing either the rhythmical representations or the arpeggios of these two Braille characters, consisting of aural elements corresponding to the dot-positions of any given Braille character. Each dot position {1, 2, 3, 4, 5, 6} of the full Braille cell is mapped onto a unique aural element[1]. Given this mapping and the fact that the dot configuration of any given Braille character is a unique subset of the dot positions of the full Braille

[1] The reader can refer to the chapter 'Either the rhythmical representation or the arpeggio of a given Braille character may be considered as a unique aural identifier of the dot configuration as well as of the motor scheme of this Braille character' .

cell, the aural representation of any given Braille character is unique due to the fact that it is a unique subset of the rhythmical elements or the notes that form the aural representation of the full Braille cell. By creating links between the dot configuration of two Braille characters as well as between their corresponding motor schemes and by aurally highlighting these relationships through triggering either the rhythmical representations or the arpeggios of two related Braille characters at a time, the aural-kinesthetic relationships between these related motor schemes become evident; hence, the possibility of forgetting the dot configuration as well as the motor scheme of any given Braille character may be reduced. The blind child does no longer memorize individual Braille characters independently, but scaffolds the dot configuration as well as the motor scheme of any newly introduced Braille character on the basis of an already known one, capitalizing on the aural –kinesthetic relationship between them. The aim is that a given blind may memorize the motor scheme and the dot configuration of any newly introduced Braille character by mastering the aural kinesthetic relationships between two related Braille characters at a time according to a given criterion of grouping.

The use of mnemonics – teaching groups of Braille letters

According to Zacharopoulou & Sharpe, (2004, cited in Ζαχαροπούλου, 2006), in order that information may be stored in memory, certain strategies are required, aiming at transferring information from short-term to long-term memory.

According to Wormsley & D'Andrea, 1997, p. 69) if pupils find it difficult to distinguish between certain characters, material can be created, juxtaposing these characters and presenting these characters as different from one another (that can underline the differences between characters), in order that the pupils may start to recognize these differences between the characters, and distinguish between them.

An example of mnemonics put forward by the above-mentioned authors is 'the letter **E** is the 5^{th} letter of the alphabet and therefore its writing includes the 5^{th} dot'. The above-mentioned authors suggest the use of mnemonics in relation to the formation of letters, the rules employed etc., so that pupils are assisted towards memorizing the way Braille characters are written.

The present method of learning Braille focuses on identifying the differences and stressing the relationships between two, three, or four Braille characters at a time. In this way, it is suggested that ***Braille characters may be memorized if presented in groups***, or if the motor scheme of one is learned on the basis of the motor scheme of another Braille character with which the former character is related. The motor scheme of every newly introduced Braille character may be learned on the basis of the motor scheme of a previously introduced Braille character, with which the latter character is related according to a given criterion of grouping. Memorizing a set of numbers, corresponding to the set of a given Braille character's dot positions and to the set of fingerings this Braille character is considered to be fragmented learning relying on rote memory and therefore tiring for the blind pupil. Other means are envisaged to scaffold the pupil's learning, such as underlining the kinesthetic relationships between two given Braille characters, or the relationships of complementarity and for older pupils of the 4^{th} grade onwards or for those who learn to employ the slate and the stylus, teaching the vertical symmetry and uncovering the relationship in terms of fingerings between vertically symmetric Braille letters is a positive way forwards in teaching and memorizing Braille, and in forging connections between the motor schemes of Braille characters.

Four main criteria for grouping

The current method of teaching Braille focuses on the stressing of similarities and differences and in general the stressing of other relationships between couplets, or triples or four different letters and characters in relation to the dot positions and fingerings employed in order to form these characters.

In order that the learning of Braille writing be facilitated, we should consider the way the Braille alphabet is formed, and more specifically, how the Braille alphabet can be organized in a limited number of cognitive structures, in order that it may be taught in a more structured way, and become more intelligible, and easier to memorize by blind pupils.

The mnemonic strategies, mentioned in this book, focus on establishing common features and differences between ***two or more Braille characters at a time***. Two or more Braille characters sharing a common characteristic may be taught as a group. Braille letters, punctuation signs and the basic Braille mathematical symbols are grouped in couples of related Braille characters, according to ***four criteria***, referring to the morphology of the Braille character.

These criteria are as follows:

- ***The kinesthetic relationship***
- ***The relation of complementary***
- ***The vertical symmetry***
- ***The horizontal symmetry***
- The mnemonic principles described can be most effectively applied in exercises of the completion variety. In these exercises the pupil is invited to fill in the missing letters from words, small expressions or phrases. These missing letters would have kinesthetic or a complementary relationship, a vertically symmetric or a horizontally symmetric relationship, that is to say, they may be written as a sequence of fingerings, adding one dot at a time, to a common set of dots.
- -Examples of kinesthetic sequences of letters for the Albanian alphabet are: **(a, b, l, p), (c, f, g, rr), (c, f, p, q), (c, d, n, rr), (c, d, n, y), (e, o, r, rr), (i, f, nj, q), (c, m, x, y), (k, m, x, q), (b, l, v, ll), (i, j, t, th),** etc.

- -Examples of couplets of Braille letters and characters written in a complementary manner in relation to the full Braille cell are: **(a, th), (z, i), (u, j), (e, xh), (comma (,) & y)**, etc.
- -Examples of couplets of vertically symmetric Braille letters (in relation to the middle vertical axis of the Braille cell) are: **(e, i), (s, sh), (f, d), (h, j),** (**v and digit**),etc.
- -Examples of couplets of horizontally symmetric Braille letters (in relation to the horizontal line in the middle of the Braille cell) are: **(m, u), (n, z) (p, v), (t, zh**), etc

a) The kinesthetic relationship

The kinesthetic relationship can be taught based on couplets, triplets or four Braille letters at a time

According to McNally (2006), learning kinesthetically means learning through some physical action. According to the above author, once a music piece is learned kinesthetically, it is never forgotten. Young (1992) calls for the physical, kinesthetic sense to be recognized and understood for its role in all musical experience, on a par with our mental capacities. Young, op. cit., believes that the elevation of all things cerebral over all things corporal leaves us poorly attuned, or even alienated from, our physical selves and more specifically, unaware of the relationship between bodily sensation and mental activity and how the physical leads the mental to construct ideas. The above author suggests that there must be a reciprocal action between our physical and psychic energies.

According to Taylor (1990), in the field of motor development, Laszlo and Bairstow (1985) have ‘recognized the crucial part which kinesthesia plays in motor programming and control. In order to execute a skilled motor act, a number of perceptual and cognitive processes occur before any motor response takes place. A plan of action is formed, based on prevailing conditions. It is based on the nature of the task, the manner in which it should be carried out, memories recalled of previous attempts, or related tasks and the envisaging of the intended goal’.

According to Inhelder (1976), for babies there is no stable boundary between the internal and external worlds until the child reaches the stage in which s/he starts to understand object permanence. At the beginning, infants relate everything to their own bodies and believe that they are the center of the world, but remain totally unaware of this fact. Gradually, infants decenter their self-centered actions and consider their body to be an object among objects in space. Initially, the child's actions are undifferentiated and not coordinated.

Taylor (1990) highlighted the discovery of the importance of reafference, in cognitive processing. Reafference is defined as natural excitation following sensory stimulation that is systematically dependent on voluntary movements of the animal, or human (Held, 1965, cited in Taylor, 1990).

According to Schmidt & Lee (1999, p. 110), proprioceptors are sensors that provide proprioceptive information of kinaesthesis about the movement of the body. These proprioceptors can be muscle receptors, such as muscle spindles gamma (γ), efferent motor neurons and type Ia and II afferent motor neurons, etc. According to the same authors (p. 112), the vibration of a tendon produces a small, rapid alternating stretch and release of the tendon which affects the muscle spindle, producing kinaesthesia. Kraemer (2009) defines kinaesthesia as the sum of total of senses associated with body movements[2].

Kinesthetic feedback

Schmidt and Lee (1999, p. 324) define inherent feedback in this way: 'Just about any movement we can make has associated with it certain sources of inherent feedback that provide a basis for evaluating these movements. Such feedback is usually rich and varied, containing substantial information regarding performance. People can gain information about many aspects of their own movements through various sensory channels. These forms of information are inherent in normal execution of a particular movement'. Depending on the nature of the movement and the source of inherent feedback, sometimes the performer knows that something went wrong before the movement has even been completed. The information provided as the movement

[2] Kinesthesie: ensemble de sensations relatives aux mouvements du corps

is executed is sufficiently useful, in the sense that the performer can predict the movement outcome before it occurs.

According to Willoughby & Polatajko (1994), *'k*inesthesia is the conscious ability to discriminate the position of body parts, and the amplitude, direction, timing, and force of movement without visual or auditory cues (Hulme et aI., 1982; Laszlo, Bairstow, Bartrip, & Rolfe, 1989; Sage, 1984), and its role in motor learning and performance has been debated. In the late 1900s it was general1y believed that kinesthetic feedback was necessary for motor learning and that feedback from one component of movement was necessary to stimulate the next movement component (Sage, 1984). This theory was known as the stimulus-response (S-R) chaining hypothesis because movement was believed to be dependent on conditioned responses (Sage, 1984). Sherrington (1906) discussed the S-R chaining hypothesis. He asserted that the central nervous system used kinesthetic feedback to modify ongoing movement acuity. Later research more critically evaluated the role of kinesthesia in motor learning (Sage, 1984; Walk & Pick, 1981).

Sometimes inherent (or kinesthetic) feedback requires no evaluation at all. On other occasions, inherent feedback is not easily recognizable and the learner must learn to evaluate them. Thus, a way should be envisaged of making explicit the outcome of Braille pupils' typing actions, providing them with aural feedback, backing up their movements and providing them with knowledge of the results of their typing action, that is to say if they produced the intended outcome which in the case of Braille writing is the intended Braille character or not. According to Schmidt & Lee (op. cit., p. 326) knowledge of results is augmented and it sometimes duplicates inherent information about goal achievement.

Through proprioception, or kinesthetic feedback, typists often notice that they had made a typing mistake. They sometimes know that something went wrong before the movement is even completed. Similarly, Braille typists sometimes may notice that they have keyed in another dot instead of the intended one, or that they have employed another set of fingerings instead of the set of fingerings corresponding to the motor scheme of the Braille character they wanted to write.

In addition, sometimes blind pupils know that something went wrong in a given Braille letter's typing action. Although in order to monitor their writing, blind pupils read their writings tactilely on Braille paper, this does not occur during the writing process, but immediately after. Blind pupils have to interrupt their writing to tactually explore the outcome of their typing action. Millar (1997) finds that touch is a slow, impoverished modality compared with vision. Hence, it would have been helpful, if another means was available to blind pupils, in order to assist them in monitoring their writing that would provide them with immediate feedback about the outcome of their previous typing action, that is to say which would instantly inform them whether they have typed in correctly any given Braille character.

Although blind children receive proprioceptive feedback concerning the relative positions of their fingerings during a typing action, sometimes they do not know what went wrong in the typing of any given Braille character. Backing up the child’s typing movements with aural feedback is of paramount importance for blind pupils who do not have the means of immediately monitoring the outcome of their typing actions.

According to Schmidt & Lee (1999), ‘during and after any movement, information produced by the movement is derived, such as the way it felt, sounded and looked as well as the result of the movement produced in the environment’. This information is called movement – produced feedback, or simply feedback.

How the kinaesthetic information is produced

According to Schmidt & Lee (1999, p. 112), the spindle consists of three main components: small muscle fibers called interfusal fibbers that are innervated by gamma (γ) efferent (motor) neurons and type Ia and II afferent neurons. The intrafusal fibbers are made of two types, bag and chain fibbers, the polar ends of which provide a tension on the central region of the spindle, called the equatorial region. The sensory receptors located here are sensitive to the length of the equatorial region when the spindle is stretched. The major neurological connection to this sensory region is the afferent fibber, whose output is related to the length of the equatorial region (position information) as well as to the rate of change in length of the equatorial region (velocity information). The other receptor for muscle information is the Golgi tendon organs: tiny receptors located in the junction where the muscle blends into the tendon. They provide information about the tension in the muscles. According to Houk and Henneman (1967; Stuart et al. 1972, cited in Schmidt & Lee 1999, p. 113), each golgi tendon organ is connected to only a small group of from 3 to 25 muscle fibers, thus the various receptors sensing forces from different parts of the muscle. According to Schmidt & Lee (1999, p. 113), 'the joints of the various limbs are surrounded by a sheath called a joint capsule which is primarily responsible for holding the lubricating fluid for the joint'. Embedded within the joint capsules are different kinds of receptor cells (Ruffini endings, pacinian corpuscles) known as joint receptors. They are located primarily on the parts of the joint capsule that are stretched when the joint is moved, originally leading investigators to believe that these receptors were involved in the perception of the joint position. However, Skoglund (1956, cited in Schmidt and Lee, op. cit.,) found that individual receptors were active at very specific locations in the range of limb movement (e.g. from 150^o to 180^o) of the joint angle for a particular cell. Another cell would fire at a different set of joint angles and so on. Presumably, the central nervous system would know where the limbs were by detecting which of the joint receptors were active. According to Schmidt and Lee (1999, p. 114), the joint receptors are sensitive to the joint position, but their output can be affected by the tensions applied and the directions of the movement. According to Schmidt & Wrisberg (2000, p. 130), the sensory information from the joints and muscles is transmitted to the brain via the spinal cord. According to Wetzel and Stuard (cited in Schmidt and Lee, 1999), the central nervous system combines and integrates information in some way, to resolve ambiguity in the signals produced by any one of these receptors.

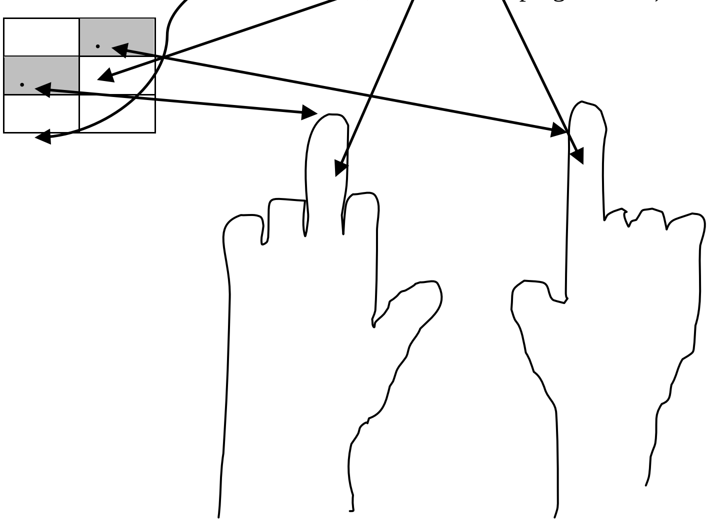
A given Braille character's rhythmical representation or arpeggio may bring in memory the dot configuration and the motor scheme of any given Braille character

Held (1965, cited in Taylor, 1990) conducted investigations of perceptual adaptation. According to Taylor, other scientists reported that accurate action in space involves more than visual perception of space alone. Held's experiments were concerned with the deliberate distortion of visual and auditory signals. Held (1965, cited in Taylor, 1990) maintained that humans and animals may adapt to visual and auditory signals fairly quickly. If blind pupils are overprotected and restrained from making voluntary movements, they may not easily adapt to auditory signals. A given Braille character's rhythmical representation consisting of rhythmical elements or arpeggio consisting of notes corresponding to this Braille character's dot-positions is a kind of auditory signal. In order to make sense of this signal, exercises involving whole-body movement may be of value in teaching blind children to differentiate between either the rhythmical elements or the notes corresponding to the dot-positions of any given Braille character. The child may move upwards or downwards or make steps in a 3X2 frame according to the pitch of a given note in the arpeggio of this Braille character, or according to the loudness of a rhythmical element (up for loud rhythmical elements and down for quiet rhythmical elements). To start with the child may step on the left or on the right after hearing each material being struck in the rhythmical representation of this Braille character, or after identifying a given note corresponding to a dot position located in a given column in the dot configuration of a given Braille character. If a blind child recognizes, or evokes either the rhythmical representation or the arpeggio of a given Braille character s/he may proceed to the corresponding typing action forming the motor scheme of any given Braille character, in order to produce its dot configuration.

Either the rhythmical representation or the arpeggio of a given Braille character may be considered as a unique aural identifier of the dot configuration as well as of the motor scheme of this Braille character

Due to fact that each Braille character has a unique dot configuration and it is typed in by a unique set of fingerings forming this Braille character's motor scheme and due to the existence of relationships of one-to-one correspondence between: dots and fingerings, dots and notes, dots and rhythmical elements, fingerings and notes, fingerings and rhythmical elements, to both the dot configuration and the motor scheme of any given Braille character, corresponds a unique rhythmical representation and a unique arpeggio.

I (2, 4) **Arpeggio** (mi, la#); **Rhythmical representation**: (moderate taping on wood, loud taping on steel)



Given that the dot configuration of a given Braille character is mapped out onto a unique corresponding set of either rhythmical elements or notes, the resulting either rhythmical representation or arpeggio may be considered to be a unique aural signifier or the represented Braille character. Either the Braille character's rhythmical representation or arpeggio may aurally represent this Braille character. According to Wikepedia[3], in semiotics, a sign is something that can be interpreted as having a meaning, which is something other than itself, and which is therefore able to communicate information to the one interpreting or decoding the sign. According to Ferdinand de Saussure (in Wikipedia) the sign relation is dyadic, consisting only of a form of the sign (the signifier) and its meaning (the signified). In the case of Braille characters, either the rhythmical representation or the arpeggio of any given Braille character may be considered as the signifier, whereas the represented Braille character may be considered as the signified.

Sol (1) Left index finger	La# (4) Right index finger
Mi (2) Left middle finger	Fa (5) Right middle finger
Do (3) Left ring finger	Re (6) Right ring finger

Clap

The proposed set of notes (sol, mi, do, la#, fa, re) corresponding to dot-positions (1, 2, 3, 4, 5, 6) and to the set of fingerings forming the motor scheme of the full Braille cell

Chandler[4] speaking about the value of signs maintains that 'Saussure uses an analogy with the game of chess, noting that the value of each piece depends on its position on the chessboard (Saussure 1983, 88)'. This especially the case for music, as the value (the pitch) of each note increases the higher the note is written on the stave; this quality of music notes may be of value for representing dot positions located high on the Braille cell. Each dot position is characterized by two dimensions, namely its relative height in the Braille cell and whether it is placed on the right or on the left side in the Braille cell. The second characteristic may be also represented in an aural way, if dots located in two different columns are played on two different musical instruments, or they acquire any other distinct music or sound characteristic (such as tremolo, played with distortion, etc).

[3] http://en.wikipedia.org/wiki/Sign_(semiotics)
[4] Daniel Chandler, 'Semiotics for Beginners',
http://visual-memory.co.uk/daniel/Documents/S4B/sem02.html
Saussure, Ferdinand de ([1916] 1974): *Course in General Linguistics* (trans. Wade Baskin). London: Fontana/Collins Saussure, Ferdinand de ([1916] 1983): *Course in General Linguistics* (trans. Roy Harris). London: Duckworth

Either a unique rhythmical representation consisting of a subset of the rhythmical elements (loud tapping on wood, moderate tapping on wood, quiet tapping on wood, loud tapping on steel, moderate tapping on steel, quiet tapping on steel) or a unique arpeggio consisting of a subset of the notes (sol, mi, do, la#, fa, re) corresponding to a subset of dot-positions (1, 2, 3, 4, 5, 6), mapping out the set of dots any given Braille character may both play the role of a unique aural identifier of the dot configuration and of the motor scheme of any given Braille character. According to the above-mentioned dots to notes mapping scheme, a unique aural identifier in the form of an arpeggio for character **A** (1) is (sol), for character **C** (1, 4) is (sol, la#), and for character **S** (2, 3, 4) is (mi, do, la#). The corresponding rhythmical identifier for character **A** (1) is (loud tapping on wood), for character **C** (1, 4) is (loud tapping on wood, loud tapping on steel), and for character **S** (2, 3, 4) is (moderate tapping on wood, quiet tapping on wood, loud tapping on steel).

Ruckmick cited in Taylor (1990) maintains that 'kinaesthesis seems very intrinsically bound up with rhythm'. Through listening to a unique sequence of either loud, moderate or quiet tapings, on two materials, a blind child may map out a loud, average or a quiet taping, to the corresponding left or right index middle or ring finger, according to the intensity of the sound being heard and the material struck. The child may be able to identify the exact dot-position that has just been typed in or the exact finger that has just been employed in the motor scheme of a given Braille character that has just been typed in, according to the gradually increasing sound intensity of each taping located on the left or in the right-hand column of this Braille character, as we move from the bottom to the top of the Braille cell. Blind children may learn to distinguish between dot positions located in the left and in the right column of a given Braille character, by paying attention to a clap aurally separating tapings corresponding to dot-positions of the left and of the right-hand column of a given Braille character and by distinguishing between sounds produced on two different materials. For each column of a given Braille character, the lowest dot-position (3, or 6) located in the 3rd row is represented by a quiet taping; the middle dot-position (2, or 5) located in the 2nd row is represented by moderate taping; and the highest dot-position (1, or 4) located in the 1st row is represented by a loud taping. Due to the one-to-one correspondence between each taping separated in each column by sound intensity and each dot-positions, a rhythmical form of representation of the dot configuration as well as of the motor scheme of any given Braille character is created; this rhythmical form of representation creates a unique aural identifier for the dot configuration and for the motor scheme of any given Braille character.

Loud tap (1) Left index finger	Loud tap (4) Right index finger
Moderate tap (2) Left middle finger	Moderate tap (5) Right middle finger
Quiet tap (3) Left ring finger	Quiet tap (6) Right ring finger

Clap

The proposed set of tapings (loud tap, moderate tap, quiet tap, clap, loud tap, moderate tap, quiet tap,) corresponding to the dot-positions (1, 2, 3, 4, 5, 6) and to the set of fingerings forming the motor scheme of the full Braille cell

In addition, a unique arpeggio may represent both the dot-positions and the corresponding set of fingerings of any given Braille character; each note in a given Braille character's arpeggio (sol, mi, do, la#, fa, re) corresponds to each dot-position (1, 2, 3, 4, 5, 6) of the full Braille cell as well as to a unique fingering namely{the left index finger, middle finger and ring finger and the right index finger, middle finger and ring finger}.

According to Taylor (1990), studies around the turn of the last century, by music psychologists interested primarily on how metrical rhythm is perceived, brought out the emerging prominence of kinaesthesis. Ruckmick (1913, cited in Taylor, op. cit.), reviewing the literature, singled it out as a special factor. *'Kinaesthesis of one sort or another, or motor expression consciously represented in the form of imagery or perceptual complex, is regarded by most investigators in this field as essential to rhythmic grouping and accentuation'* (Ruckmick, 1913, p. 306 cited in Taylor 1990). According to Taylor (1990), 'throughout the performance of a set of movements, sensory information is generated... There is continuous monitoring of kinesthetic information about position and movement, of the body and limps, along with visual, auditory and tactile information through a sensory feedback loop'. Blind pupils receive kinaesthetic information in each Braille character's typing action involving the unique set of fingerings that have been employed in the previously typed in Braille character's motor scheme. Most of these Braille character's motor schemata have been stored in blind pupils' memory, provided that these Braille characters have been previously taught and written in exercises. The aim would be that the blind child is able to monitor his /her previous typing actions, in order to verify that the previous Braille character's motor scheme that has been typed in was the intended one; if the previously typed in Braille character is an unintended one, the child would have to wipe out and retype it, so as to produce its already memorized aural representation. Blind pupils may learn to establish an one-to-one correspondence between any given set of fingerings forming a given Braille character's motor scheme with the rhythmical representation or arpeggio corresponding to this Braille character, in order that they may easily evoke either the corresponding unique set of either rhythmical elements or notes forming the rhythmical representation or the arpeggio of a given Braille character respectively in order to compare it with the actually produced one, and receive aural feedback from their previous typing action. Either a given set of rhythmical elements or the corresponding set of notes forming the rhythmical representation and the arpeggio of this Braille character are mapped out onto the motor scheme of this Braille character, as well as onto the corresponding dot configuration of the Braille character produced as a result of this Braille character's typing action. This can be achieved through mapping either each individual rhythmical element or each note onto a given fingering employed for Braille writing in order to aurally back up every Braille character's motor scheme. Provided that these unique aural identifiers of Braille characters have already been memorized, by listening to a given Braille character's either rhythmical representation or arpeggio triggered just after the intended Braille character's typing action, a blind child may receive unique augmented feedback mapping his/her proprioceptive feeling of the set of fingerings that have just been employed in the previous Braille character's typing action, onto a corresponding set of easily identifiable aural elements, provided that the blind child has been trained to aurally distinguish these elements. This unique set of aural elements of the just typed in Braille character may be contrasted to the set of aural elements forming the rhythmical representation or the arpeggio of the intended Braille character, that is to say, to the memorized unique aural identification of the Braille character that the child had previously the intention to write. Blind pupils may learn to pay attention to such an aural identifier, that is to say to either the rhythmical representation or the arpeggio of the just typed in Braille character, in order to be informed that the previous typing action was the intended one or an incorrect-unanticipated character; In the latter case, blind pupils may acquire information about what went wrong in the previous Braille character's typing action. The rhythmical or the musical feedback that may become available to any given blind pupil after a given Braille character's typing action is designed in such a way, in order to underline the child's proprioceptive information on the set of fingerings that have just been employed in the previous Braille character's typing action. By comparing either the rhythmical information or the arpeggio of the actually typed in Braille character with the corresponding Braille character's aural representation that has already been memorized that the blind child had the intention to write, the blind pupil may immediately realize if his/her previous typing action was correct or incorrect in order to either carry on his/her writing and type the next Braille character in a given word or sentence context, or wipe out and rewrite the previously typed in (mistaken) Braille character.

A (sol)

Sol (1)	

C (sol, la#)

Sol (1)	La# (4)

S (mi, do, la#)

	La# (4)
Mi (2)	
Do (3)	

A (sol)

Sol (1)	

M (sol, do, la#)

Sol (1)	La# (4)
Do (3)	

X (sol, do, la#, re)

Sol (1)	La# (4)
Do (3)	Re (6)

Aurally representing kinaesthetically related Braille characters **A (**1**), M (**1, 3, 4**), X (**1, 3, 4, 6**)**

A (loud tapping on wood)
moderate tapping on steel)

Loud tapping on wood (1)	

E (loud tapping on wood,
moderate tapping on steel)

Loud tapping on wood (1)	
	Moderate tapping on steel (5)

O (loud tapping on wood,
quiet tapping on wood,

Loud tapping on wood (1)	
	Moderate tapping on steel (5)
Quiet tapping on wood (3)	

Rhythmically representing kinaesthetically related Braille characters **A (**`1**), E (**1, 5**), O (**1, 3, 5**)**

According to Swanwick and Tilllman (1986) a musical gesture is an abstraction of a physical gesture. Vernon Lee (1932) suggested that music has the power of setting up movements in us; of making us march, dance and move our limbs in imitation of its movements. Hence either a rhythmical representation or an arpeggio consisting of notes corresponding to the set of fingerings employed in the motor scheme of a given Braille character may assist blind children in making the right choice of fingerings in a given Braille character's motor scheme and pre-structure his/her following typing action.

In the long term, over the repeated co-hearing of a given Braille character's either rhythmical representation or arpeggio, blind pupils may be able to associate either the dot configuration or the motor scheme of a given Braille character with its corresponding either rhythmical or musical form of representation. According to Wikipedia, a phenomenon called long-term potentiation allows a synapse to increase strength with increasing numbers of transmitted signals between the two neurons[5]. Ultimately, they may be able to aurally recognize any given Braille character by its corresponding either rhythmical representation or its arpeggio. Both the corresponding Braille character's rhythmical representation or arpeggio may serve as an aural identification of either the motor scheme or of the dot configuration of this Braille character.

In so doing, blind pupils may associate a set of fingerings in a given Braille character's motor scheme with the corresponding set of rhythmical elements in the rhythmical representation and with the set of notes in the arpeggio of this Braille character and consequently to the set of dot positions forming its dot configuration.

Either the rhythmical representation or the arpeggio for any given Braille character may provide blind children with aural - kinesthetic feedback following each individual Braille character's typing action.

If children listen to either the rhythmical representation or the arpeggio corresponding to the dot configuration of any given Braille character immediately after the corresponding typing action, this rhythmical representation or arpeggio may play the role of immediate rhythmical or music feedback, allowing them to identify aurally the motor scheme employed in the previous typing action of any given Braille character and the dot configuration of the Braille character that has been produced as a result.

[5] http://en.wikipedia.org/wiki/Encoding_(memory)#Long-term_potentiation

Either the rhythmical representation or the arpeggio consisting of notes corresponding to the dot-positions of a given Braille character may be considered as *a device promoting blind pupils' kinesthetic awareness, as it highlights the set of fingerings, employed in a given Braille* character*'s typing action. In other words, either the rhythmical representation or the arpeggio of a given Braille character may highlight its motor scheme, denoting the set of fingerings employed in the Braille character's typing action. Either the rhythmical representation or the arpeggio of any given Braille character may provide a form of concurrent feedback as if it is triggered immediately after a given typing action, it may show the set of fingerings that have been employed in it corresponding to a given dot configuration, which may be the expected one, or it may deviate from the expected in the case of a typing mistake. Either the rhythmical representation or the arpeggio of any given* Braille character, may back up this Braille character's typing action. If pre-heard, or evoked before a given Braille character's typing action, this rhythmical representation or the arpeggio of any given Braille character may be considered to be an action plan, specifying the set of fingerings that would have to be employed in the motor scheme of the next Braille character to be typed in; either the rhythmical representation or the arpeggio organizes the next Braille character's set of fingerings in the corresponding Braille character's motor scheme, to be employed in the corresponding typing action. This set of fingerings may be reset every time a given blind child pre-hears or evokes the rhythmical representation or the arpeggio of the corresponding Braille character to be written next. Through prehearing a given Braille character's rhythmical representation or arpeggio, a given blind pupil may aurally identify the Braille character to be written next in a given word context, facilitating the decoding process. Hence the rhythmical representation or the arpeggio of any given Braille character being triggered, or evoked, before the corresponding typing action may assist the child in evoking the motor scheme of this Braille character to be employed in the typing action. In addition, either the rhythmical representation or the arpeggio of any given Braille character may play the role of an easily accessible organizing aural device assisting in the comparison of the motor schemes of two or more Braille characters, each motor scheme consisting of a unique set of fingerings. In the case of kinesthetically related Braille characters they would assist in the identification of the common set of fingerings in these two Braille character's motor schemes and of any extra fingering(s) to be added to the common set of fingerings in the fuller, in terms of dots kinesthetically related Braille character; such a co-hearing of two or more either rhythmical representations sharing a common set of rhythmical elements or arpeggios, sharing a common set of notes, may assist blind pupils in comparing the dot configuration of these two or more kinesthetically related Braille characters, assisting in the identification of the corresponding common set of dots and of any extra dot(s) in the dot configuration of the fuller in terms of dots kinesthetically related Braille character.

Rhythmical representations or arpeggios of Braille characters underline proprioceptive information

According to Schmidt & Lee (1999, p. 324) people can gain information about many aspects of their own movements through various sensory channels. These forms of information are inherent in normal execution of a particular movement.
Barrow and Brown (1988) suggest that 'individuals receive kinesthetic feedback, in relation to the position of the members of their own bodies', which is the ability to know body position and where body parts are, through '*proprioception'*. In the absence of visual feedback, blind pupils may rely on proprioceptive or kinesthetic feedback, to perform a variety of actions, including the typing of any given Braille character. Kinesthetic feedback is a '*feedback that confirms the accuracy of a student's response and provides corrective information necessary'* (Schunk, 2009).

In the case of Braille typing, the kinesthetic feedback stems from a given blind child's awareness regarding the position of his /her fingerings during and immediately after the typing action of a given Braille character. This awareness concerns the motor scheme employed by a blind pupil, in order to write a given Braille character and it may confirm or disconfirm the previous Braille character's typing action.

Whole-body movement exercises may be created for any given Braille character aiming to assist blind children in recognizing and distinguishing between either loud, moderate and quiet tapings or between high, middle and low notes corresponding to high, middle and low dot-positions, located in the first (the highest), the second (the middle) as well as in the third (the lowest) row of the Braille cell, as well as between either rhythmical elements or notes corresponding to dots of the left and of the right-hand column of the Braille cell or of any given Braille character, corresponding to fingerings of the left and the right hand, which if employed they would write dot positions located on the left or on the right hand column of a given Braille character.

On the other hand, as proprioceptors, somatosensors provide kinesthetic information about body movement and the relative position of different body parts and cutaneous receptors in the skin and underlying tissues provide information about touch temperature, pain and pressure (Denkinson, 1974, cited in Haywood and Getchell (2001, p. 199). Some of the cutaneous receptors respond to mechanical stimulation, some to thermal and pain stimulation and others to bending of the hair and pressure on the skin.

According to Haywood and Getchell (2001**)**, many infantile reflexes are stimulated through kinesthetic receptors. Therefore the onset of a reflex indicates that the kinesthetic receptor involved is functioning.

Up to now, scant attention has been paid to the kinesthetic sense and its implications for educating the blind. However, kinaesthesia is a proper, relatively unexplored sensory modality. Ways should be envisaged of exploring the potentiality of this almost unexplored sensory modality in blind education. In Braille literacy, kinesthetic awareness may inform the blind that a particular motor goal has been reached while it may assist blind children identifying any mistaken fingering(s) in the motor scheme of the just typed in Braille character. Designing activities aiming at promoting kinesthetic awareness is of value, as blind pupils may rely on kinesthetic awareness in order to be informed whether they have employed in the motor scheme of the Braille character they intended to write. Kinaesthesia may be fruitfully explored in a wide range of motor and physical impairments for specific rehabilitation purposes (following an accident, a trauma, etc.). The rehabilitation goal may be to provide augmented feedback related to the position of a given limb, or other body member to be attained which is indicated by the simultaneous sounding of an associated aural cue, as soon as a given body member completes the required motor task. Kinaesthesia may also pay a crucial role for rehabilitation purposes for the physically handicapped, assisting them in realizing where their limbs are and informing them about a mistaken body position, if the latter is highlighted via a specific aural stimulus.

A useful idea in promoting kinesthetic awareness in blind children but also in the physically handicapped would be to couple key movements in sports as well as in everyday activities that the above pupils have completed successfully with discrete sound-effects. Alternatively, these sound effects may accompany a particular movement whereas they may reach a maximum reinforcement upon assuming the desired body-position, informing these pupils that the desired body-position has been reached. Distinct sounds may be associated with all desired body-postures – positions to be assumed which are necessary in order to successfully complete the requested movement, or physical exercise. Related sound effects may be associated with given locomotion, or manipulative movements, involving giving force to objects, or receiving force from objects; and finally with stability movements. A given blind child may try to be guided towards the achievement of the desired goal of movement by the associated aurally augmented feedback informing the child the associated motor goal has been reached. Harrow (1972) has classified all human movement in a hierarchical scheme with six levels, or categories with subcategories under each. The scheme is arranged so that educators can establish behavioral objectives along with developing criteria and teaching strategies. Harrow's movement levels are reflex movements, basic fundamental movements, perceptual abilities, physical abilities skilled movements and no discursive communication.

Beard (1969), referring to the end of the sensorimotor period, mentions that the child needs a device that would enable him/her to reconstruct his history of his/her acts as succeeding each other, as s/he often considers the sequence of events as isolated and s/he does not take into account the interrelationships between his/her actions. In the case of Braille writing, a device is needed that would assist a given blind child in taking into account the interrelationships between the motor schemes of different Braille characters. Triggering the rhythmical representation or the arpeggio of each Braille character immediately after corresponding typing action may underline the set of fingerings employed in the previous typing action, and in the long run after sufficient exposure to the Braille characters' rhythmical representations or arpeggios it may assist the children memorize them as aural signifiers of the motor scheme of each Braille character. Listening to the rhythmical representations or the arpeggios of two kinesthetically related Braille characters one after the other, may underline the fingering that should be added to the motor scheme of the kinaesthetically related

Braille character consisting of fewer dots, in order to derive the motor scheme of the fuller, in terms of dots Braille character. Listening to the rhythmical representations or the arpeggios of two complementary Braille characters one after the other may aurally show ***that the set of fingerings employed in the motor scheme of the second complementary Braille character are the remaining ones, after the fingerings employed in the motor scheme of the 1st complementary Braille character have been removed from the six fingerings employed for Braille writing.*** The listening to the rhythmical representations or the arpeggios of two vertically symmetric or Braille characters one after the other may aurally demonstrate all the related transformations in terms of fingerings, needed for the formation of the motor scheme of the second vertically symmetric Braille character on the basis of the motor scheme of the first vertically Braille character. The same statement applies to horizontally symmetric Braille characters. Such a co-listening may assist the blind child in contrasting any two related Braille characters' motor schemes, and in distinguishing between either the dot configuration, or between the two motor schemes of two mirror letters at a time on the basis of their aural representations. There are given *criteria of transformation* in *vertical symmetry* and different in *horizontal symmetry*. In vertical symmetry every fingering of the left hand in the motor scheme of the first vertically symmetric Braille letter becomes the same fingering of the right hand in the motor scheme of the second vertically symmetric Braille letter. And vice versa, every fingering of the right hand in the motor scheme of the first vertically symmetric Braille letter becomes the same fingering of the left hand in the motor scheme of the second vertically symmetric Braille letter. Consider the motor scheme of vertically symmetric Braille letters **E** (1, 5) & **I** (2, 4). The former consists of the left index finger and of the right middle finger, while the latter consists of the right index finger and of the left middle finger; blind children may employ the former Braille letter **E** (1, 5) in order to derive the motor scheme of its vertically symmetric Braille character **I** (2, 4). The index finger of the left hand in the motor scheme of letter **E** → becomes index finger of the right hand in the motor scheme of letter **I** and the middle finger of the right hand in the motor scheme of letter **E** → becomes middle finger of the left hand in the motor scheme of its vertically symmetric letter **I** (2, 4). In horizontal symmetry, all transformations in terms of fingerings take place in the same hand. In horizontally symmetric Braille characters the index finger in the motor scheme of the first horizontally symmetric Braille character becomes ring finger in the motor scheme of the second horizontally symmetric Braille character; and vice versa, the ring finger in the motor scheme of the first horizontally symmetric Braille character becomes index finger in the motor scheme of the first horizontally symmetric Braille character, whereas any middle finger, if it exists in the motor scheme of the first horizontally symmetric Braille character, remains unaltered in the motor scheme of the second horizontally symmetric Braille character.

In order to improve the memorization of the morphological relations between letters or other symbols by the pupil, this book makes use of different methods:

a) It argues that an appropriate Braille pedagogy requires the familiarization of students with the concept of symmetry. This notion of symmetry can later be applied to teach couplets of letters that are written in a symmetrical way

1) in relation to the middle vertical axis of the Braille cell and
2) in relation to the middle horizontal line of the Braille cell.

A certain methodology for teaching symmetry to blind pupils is put forward; this may be further elaborated.

b) In addition, the current method of Braille pedagogy also makes use of the notion of complementarity, in relation to the full cell. There are couplets of Braille letters, or Braille letters and other Braille symbols that are written in a complementary manner, in relation to the full Braille cell.

c) The current book suggests that kinesthetic learning is one of the most effective ways of teaching a series of two, three, or four Braille characters at a time. This kinesthetic learning occurs when the pupils memorize couplets, triples, or four letters that differ between themselves by one or more dots at a time. The pupil then memorizes the writings of the letters that have a kinesthetic relationship as a sequence of fingerings.

More specifically:

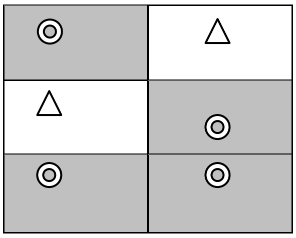
1. The current article suggests that couplets of kinaesthetically related Braille characters letters differing by one, two or three dot(s) may be taught together. The current method purports to be easier for couplets of letters differing by one, two or three dot(s) to be memorized by the student. These couplets of letters share a common set of dots but the second letter is written, in addition to this common set of dots (the dots of the first letter), with one more dot. The current paper suggests that Braille letters should be taught as kinesthetic letter sequences, starting with letters that are written with one dot, adding one dot at a time, and finally ending with letters written with four, five or six dots . The reverse order of learning letters can also be put forward. Starting with letters written by six (é), five (q) or four (p) dots, removing one dot at a time, and finally ending to letters written with one dot (a).

Exploring the criterion of complementarity

Couplets of complementary Braille characters may be taught together. Complementary Braille characters have no dot positions in common, and if the dot positions of the first Braille character are added to the dot positions of its complementary Braille character, the dot positions of the full Braille cell {1, 2, 3, 4, 5, 6} emerge. The criterion of complementarity is related to subtraction. According to Beard (1969), the criterion of combinativity maintains that the elements of two sets can be joined in order to form the elements of a greater set. In mathematical terms A + A'=B. In the case of Braille characters, the full Braille cell (1, 2, 3, 4, 5, 6) may be perceived as the greater set, B. According to Beard (1969), two distinct classes may be combined into a comprehensive class which embraces them both, e.g. men and women = adults.

2. The presence of all six dots in the full Braille cell (1, 2, 3, 4, 5, 6) may be perceived as the total set of dots, to which the two sets of dots of two complementary characters (for example, A and A') may add up to. If a given set of dots (either **A** or **A'**) forming the set of

dots of one of the two complementary Braille characters are taken out from the set of dots of the full Braille cell, the set of dots corresponding to the dots of the second complementary Braille character in a given couplet (A’ or A) may be derived. The two sets of dots (**p, q**) of the two complementary Braille characters are incompatible (**p/q**). If a dot element a, belongs in the set of dots of the first complementary Braille character, it does not belong in the set of dots of the second complementary Braille character. An analogous statement holds for the two sets of fingerings corresponding to the motor schemes of the two complementary Braille characters. If a given fingering, is included in the set of fingerings defining the motor scheme of the first complementary Braille character, this fingering does not belong into the set of fingerings defining the motor scheme of the second complementary Braille character. Hence the set of fingerings forming the motor scheme of the second complementary Braille character may be derived by removing the set of fingerings forming the motor scheme of the 1st complementary Braille character from the set of fingerings forming the motor scheme of the full Braille cell, which are employed for Braille writing, that is to say, from the left and the right index, middle and ring fingers. In order to demonstrate this relationship of complementary Braille characters, two sets of pegs of two different shapes may be employed, in order to represent the dots of each of the two complementary Braille characters. Each set of pegs may be placed on each Braille character’s dot-positions, on an enlarged Braille cell model. If all the pegs of the two sets have been appropriately placed on the corresponding dot-positions of the first and the second complementary Braille character, all the dot-positions of the full Braille cell (1, 2, 3, 4, 5, 6) would be filled in with pegs.



***An enlarged Braille cell model showing complementary characters Z** (1, 3, 5, 6)*
(round pegs) and ***I** (2, 4)(triangular pegs)*

For example, Braille characters **I** (2, 4) & **Z** (1, 3, 5, 6) are complementary, as they have no dot-position in common and their unison is the dot configuration of the full Braille cell (1, 2, 3, 4, 5, 6). In order to teach the dot configuration of these characters, dots (2, 4) of Braille character **I** (2, 4**)**, may be shown with triangular pegs, whereas dots (1, 3, 5, 6) of Braille character **Z** (1, 3, 5, 6) may be shown with round pegs; both these two sets of pegs may be placed either on an enlarged Braille cell model or on the closed swing cell. Then the swing cell may be opened in order to represent the fingerings employed in the motor scheme of each of the two complementary characters, (here of Braille characters **I** and **Z**) on the keyboard of the Perkins Brailler. It may be explained to blind pupils that the dot-positions of the second or the derived complementary Braille character are *all* the dot-positions of the full Braille cell which are *not included in* the dot-positions of the first complementary Braille character. In other words the dot-positions of the derived complementary character are the empty dot-positions in the full Braille cell, after children have placed the pegs corresponding to the dot-positions of the first complementary Braille character on some of the dot-positions of the full Braille cell.

Exploring the notion of the complementary

Another way in which the pupils are assisted to memorize Braille letters is to be acquainted with the notion of complementarity in relation to the full Braille cell.

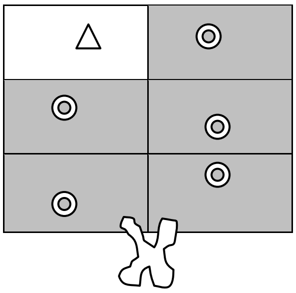
Based on the notion of the complementary, the Braille symbols can be taught in couplets. If the pupils know the way a certain Braille symbol or letter is written, and if they are aware of the fact that two symbols are complementary, they can guess how the second symbol is written. For example, if pupils know that letters **i** (2, 4) & **z** (1, 3, 5, 6) are complementary in relation to the full Braille cell and the way the letter **i** (2, 4) is written, they can deduce the way the second complementary symbol **z** (1, 3, 5, 6) is written. To find the fingerings used for the writing of the letter **z** (1, 3, 5, 6), they would use, from the six fingers used to write in the Perkins machine, ***the fingers not being used*** during the writing of the first symbol **i** (2, 4). The same reasoning can be applied to every other couplet of complementary letters and other symbols, namely:

- **J** (2, 4, 5) & **U** (1, 3, 6)
- **A** (1) & **th** (2, 3, 4, 5, 6)
- **B** (1, 2 & **(number or digit symbol)** (3, 4, 5, 6)
- **C** (1, 4) & **()** (2, 3, 5, 6)
- **D** (1, 4, 5)& **Quote open (“)** (2, 3, 6)
- **e** (1, 5) & **xh** (2, 3, 4, 6)
- **G** (1, 2, 4, 5) & **minus** or/ **hyphen** (-) (3, 6)
- **M** (1, 3, 4) & **Point (.)** (2, 5, 6)
- **N** (1, 3, 4, 5) & **(?)** (2, 6)
- **ë** (1, 6) & **t** (2, 3, 4, 5)
- **S** (2, 3, 4) & **sh** (1, 5, 6)
- **R** (1, 2, 3, 5) & **Caps** (4, 6)
- **X** (1, 3, 4, 6) & **(:)** (2, 5)
- **Y** (1, 3, 4, 5, 6) & **comma (,)** (2)
- **ç** (1, 4, 6) & **(!)** (2, 3, 5)
- **dh** (1, 4, 5, 6) & **(;)** (2, 3)

- For example, letters **t** (2, 3, 4, 5) and **ë** (1, 6) are complementary symbols, in relation to the full Braille cell, as *none of the dots of the letter* **t** (2, 3, 4, 5) coincide with any of the dots of the letter **ë** (1, 6) and vice versa: The dots of the letter **t** (2, 3, 4, 5) and the dots of the letter **ë** (1, 6), if they are added to an empty Braille cell, the full Braille cell is formed, that is to say, the Braille cell, including all six dots, is formed. If the pupils are aware of this complementary relation between the two letters, they can deduce the way the letter **ë** (1, 6) is written from the way the letter **t** (2, 3, 4, 5) is written and vice versa, if they know that in order to write the letter **ë** (1, 6) they would use, from the six fingers employed to write in the Perkins machine, those fingers that have not been used in the writing of **t** (2, 3, 4, 5).

According to the criterion of complementarity, blind children may derive the motor scheme of a given Braille character from the motor scheme of its complementary Braille character which is already known to them. Blind pupils may derive the set of fingerings forming the motor scheme of the second complementary Braille character in a given couplet, *by taking out* from the six fingers employed for Braille writing, that is to say from the left and right index, middle and ring fingers, *the fingers corresponding to the motor scheme of the 1st already known to them complementary Braille character*. Then blind pupils would have to employ the remaining fingers in order to derive the motor scheme of the second complementary Braille character in the couplet and type this character. In the above example, if blind pupils know that Braille characters **I** (2, 4) and **Z** (1, 3, 5, 6) are complementary, in order to derive the motor scheme of the second complementary Braille character **Z** (1, 3, 5, 6) on the basis of character **I**, from the six fingers employed for Braille writing, blind pupils would have to take out the set of fingers corresponding to the motor scheme of Braille letter **I** (2, 4), that is to say the left middle finger and the right index finger and employ all the remaining fingers, in order to type in Braille character **Z** (1, 3, 5, 6); in this case, blind pupils would have to employ {the left index and ring fingers and the right middle and ring fingers}.
If blind pupils know that Braille character **A** (1) and Braille letter **th** (2, 3, 4, 5, 6) are complementary, in order to derive the motor scheme corresponding to Braille letter **th** (2, 3, 4, 5, 6), from the six fingers employed for Braille writing, blind pupils may take out the fingerings corresponding to the motor scheme of the 1st complementary Braille letter **A** (1), that is to say

the left index finger and employ all the remaining fingers, in order to derive the motor scheme of Braille letter **th** (2, 3, 4, 5, 6). That is to say, to achieve this goal, blind pupils may employ the left middle and ring fingers and the right index, middle and ring fingers.



***An enlarged Braille cell model depicting complementary characters A** (1) **and* th** (2, 3, 4, 5, 6).

According to Yu-Ching Chang (2001), in England pupils at Key Stage One are expected to cultivate musical ability through exploring the sounds of their own voices and playing simple musical instruments. By rehearsing the rhythmical representations or sing the arpeggios of two given Braille characters related according to a given criterion of grouping, blind children may memorize the dot configuration and the motor schemes of these two Braille characters and cultivate their musical ability as well.

In each exercise involving a given couplet of complementary Braille characters, teachers may trigger the rhythmical representations or the arpeggios corresponding to the dot configuration of two complementary Braille characters and invite blind pupils to identify and name the dot-positions of the initial, and of the derived, complementary Braille character. Teachers may play the two rhythmical representations and the two arpeggios corresponding to the dot configuration of the two complementary Braille characters and invite them to rehearse and sing them along one after the other as many times as it is necessary to memorize them; Subsequently blind children may be invited to rehearse each Braille character's rhythmical representation or sing its arpeggio every time they want to type it in, in order to form an internal aural representation of the Braille character’s motor scheme and of the dot configuration of each Braille character.

In addition, blind pupils would form an aural association between either the two rhythmical representations or between the two arpeggios of two complementary Braille characters at a time.

If one of the two rhythmical representations or arpeggios of the two complementary Braille characters has been memorized, blind pupils may derive the motor scheme of this Braille character by translating either each rhythmical element in the rhythmical representation or each note in the arpeggio into the corresponding fingering, and group together the emerging set of fingerings to form the motor scheme of the 1st complementary Braille character. The motor scheme of the second complementary Braille character may be derived either by taking all the remaining fingerings employed for Braille writing which are not included in the motor scheme of the first complementary Braille character, or by rehearsing all the remaining rhythmical elements or by singing all the remaining notes from the set of notes (sol, mi, do, la#, fa, re) when the notes forming the arpeggio of the first complementary character have been taken out of the above set; subsequently blind pupils may map either the rhythmical elements in the derived rhythmical representation or the notes in the derived arpeggio of the second complementary Braille character into the corresponding fingerings. This approach may also be employed in order to derive the dot positions of the second complementary Braille character. On the basis of the rhythmical representation or of the arpeggio of the 1st complementary Braille character blind pupils may derive either the rhythmical representation or the arpeggio of the 2nd complementary Braille character and map either the rhythmical elements in the rhythmical representation or the notes in the derived arpeggio into the corresponding dot positions, in order to derive the dot configuration of the 2nd complementary Braille character. The derived set of notes may indicate the set of fingerings, forming the motor scheme of the 2nd complementary Braille character.

At that point the enlarged Braille cell model may be swung open as the scissors indicate, to derive the set of keys that should be typed in, in order to derive the two corresponding set of fingerings of the first as well as of the second complementary Braille character, forming the motor schemes of these two complementary Braille characters.

3. After thorough instruction in the principles of complementarity, complementary Braille characters may be presented to blind pupils one after the other. For every couplet of complementary characters, teachers can look in electronic dictionaries for words, in which the two complementary characters are encountered together, in a given word context, one after the other, in a given and subsequently in the reverse order. Blind pupils may be invited to write two complementary Braille characters, preferably one after the other, in a given and its reverse order in the context of a given word or of a small sentence or as the last character in the previous word and the first character in the following word, or with the easily written character **A** (1) in between them, or blind pupils may be invited to fill in each of these complementary Braille characters separately, in completion variety exercises. Teachers may make relative searches in electronic dictionaries for word including the character cluster of the two complementary Braille characters in a given and the reverse order, when the character A is in between them.

4. Blind pupils may be invited to write words in which complementary characters are juxtaposed to each other, or blind pupils may be invited to fill in the two complementary Braille characters in completion variety exercises in which the two missing complementary characters not juxtaposed would have to be filled in,

in words, or in small sentences. The readers should have to look at familiar or frontier words which are easiest to learn, according to which two complementary characters may be memorized. Frontier words are somewhat familiar words that are easy to learn and which may be used for mnemonic devices[6].

5. These words may be repeatedly employed in order to assist blind pupils in realizing the relationship between the two sets of fingerings employed in the motor schemes of the two complementary Braille characters.

In order to teach related sets of letters (that is to say, either letters that have a symmetrical relationship in relation to the middle vertical axis, or in relation to the middle horizontal line or that are written in a complementary manner in relation to the full Braille cell, or that have a kinesthetic relationship, because they are written with a common set of dots and one of them has one, two, three, or four additional dots), words, expressions or phrases are employed in which each time the related letters are placed in a sequence in the word, or in the phrase. These sequences of related letters aim to assist pupils towards realizing the relationships between sets of letters in terms of keystrokes, or in terms of fingerings.

The mnemonic principles described can be most effectively applied in exercises of the completion variety. In these exercises the pupil is invited to fill in the missing letters from words, small expressions or phrases. These missing letters would have kinesthetic or a complementary relationship

A full table of the letters of the Albanian Braille alphabet and punctuation signs that share a kinesthetic relationship between them is presented below.

[6] 9 types of Mnemonics for Better Memory, Dennis Congos, University of Central Florida, http://www.learningassistance.com/2006/january/mnemonics.html

Couplets of Braille letters of the Albanian Braille Alphabet and punctuation signs that are kinesthetically related the dot configuration of which differs by one dot

1. The letters **A, a (**1) and **B, b (**1, 2)
2. The letters **A, a (**1) and **C, c** (1, 4)
3. The letters **A, a (**1) and **K, k** (1, 3)
4. The letters **A, a (**1) and **E, e (**1, 5)
5. The letters **A, a (**1) and **ë** (1, 6)

6. The letters **B, b (**1, 2) and **H, h (**1, 2, 5)
7. The letters **B, b (**1, 2) and **F, f (**1, 2, 4)
8. The letters **B, b (**1, 2) and **L, l (**1, 2, 3)

The letter **B, b** *has also been mentioned in 1.*

9. The letters **C, c** (1, 4) and **D, d (**1, 4, 5)
10. The letters **C, c** (1, 4) and **F, f (**1, 2, 4)
11. The letters **C, c** (1, 4) and **M, m** (1, 3, 4)
12. The letters **C, c** (1, 4) and **ç** (1, 4, 6)

The letter **C, c** *has also been mentioned in 2.*

13. The letters **D, d (**1, 4, 5) and **E, e (**1, 5)
14. The letters **D, d (**1, 4, 5) and **N, n** (1, 3, 4, 5)
15. The letters **D, d (**1, 4, 5) and **G, g (**1, 2, 4, 5)
16. The letters **D, d (**1, 4, 5) and **dh** (1, 4, 5, 6)

The letter **D, d** *has also been mentioned in 10.*

17. The letters **E, e (**1, 5) and **H, h (**1, 2, 5)
18. The letters **E, e (**1, 5) and **O, o** (1, 3, 5)
19. The letters **E, e (**1, 5) and **D, d (**1, 4, 5)
20. The letters **E, e (**1, 5) and **sh** (1, 5, 6)

The letter **E, e** has *also been mentioned in 4, 14.*

21. The letters **F, f (**1, 2, 4) and **P, p (**1, 2, 3, 4)
22. The letters **F, f (**1, 2, 4) and **nj** (1, 2, 4, 6)
23. The letters **F, f (**1, 2, 4) and **G, g** (1, 2, 4, 5)
24. The letter **F, f** has been mentioned previously in 7, 11.

25. The letters **G, g (**1, 2, 4, 5) and **H, h (**1, 2, 5)
26. The letters **G, g (**1, 2, 4, 5) and **J, j (**2, 4, 5)
27. The letters **G, g (**1, 2, 4, 5) and **r** (1, 2, 3, 4, 5)
28. The letters **G, g (**1, 2, 4, 5) and **gj** (1, 2, 4, 5, 6)
29. *The letter* **G, g (**1, 2, 4, 5) *has also been mentioned in 16, 24.*

30. The letters **H, h (**1, 2, 5) and **zh** (1, 2, 5, 6)
31. The letters **H, h (**1, 2, 5) and **R, r** (1, 2, 3, 5)

The letter **H, h** *has been mentioned previously in 6, 18, 26*

32. The letters **I, i (**2, 4) and **S, s (**2, 3, 4)

33. The letters **I, i (**2, 4) and **J, j (**2, 4, 5)
34. The letters **I, i (**2, 4) and **F, f (**1, 2, 4)

35. The letters **J, j (**2, 4, 5) and **T, t** (2, 3, 4, 5)
36. The letter **J, j (**2, 4, 5) *and the* ***colon (:)*** *(2, 5)*
*The letter **J, j (**2, 4, 5) has been mentioned previously in 27, 34.*

37. The letters **K, k** (1, 3) and **L, l (**1, 2, 3)
38. The letters **K, k** (1, 3) and **M, m (**1, 3, 4)
39. The letters **K, k** (1, 3) and **O, o** (1, 3, 5)
40. The letters **K, k** (1, 3) and **U, u** (1, 3, 6)
The letter **K, k** *has also been mentioned in 3.*

41. The letters **L, l (**1, 2, 3) and **P, p (**1, 2, 3, 4)
42. The letters **L, l (**1, 2, 3) and **R, r** (1, 2, 3, 5)
43. The letters **L, l (**1, 2, 3) and **V, v** (1, 2, 3, 6)
The letter **L, l** *has also been mentioned in 8 & 40.*

44. The letters **M, m (**1, 3, 4) and **P, p (**1, 2, 3, 4)
45. The letters **M, m (**1, 3, 4) and **N, n** (1, 3, 4, 5)
46. The letters **M, m (**1, 3, 4) and **X, x** (1, 3, 4, 6)
The letter **M, m** *has also been mentioned in 12, 41.*

47. The letters **N, n** (1, 3, 4, 5) and **Y, y** (1, 3, 4, 5, 6)
48. The letters **N, n** (1, 3, 4, 5) and **O, o** (1, 3, 5)
49. The letters **N, n** (1, 3, 4, 5) and **Rr** (1, 2, 3, 4, 5)
The letter **N, n** *has also been mentioned in 15, 48.*

50. The letters **O, o** (1, 3, 5) and **R, r** (1, 2, 3, 5)
51. The letters **O, o** (1, 3, 5) and **Z, z (**1, 3, 5, 6)
The letter **O, o** *has also been mentioned in 19, 42, 51.*

52. The letters **P, p (**1, 2, 3, 4) and **S, s (**2, 3, 4)
53. The letters **P, p (**1, 2, 3, 4) and **Rr** (1, 2, 3, 4, 5)
The letter **P, p** *has also been mentioned in 22, 44, 47.*

54. The letters **Rr** (1, 2, 3, 4, 5) and **R, r** (1, 2, 3, 5)
55. The letters **Rr** (1, 2, 3, 4, 5) and **G, g (**1, 2, 4, 5)
56. The letters **Rr** (1, 2, 3, 4, 5) and **T, t** (2, 3, 4, 5)
57. The letters **Rr** (1, 2, 3, 4, 5) and **é** (1, 2, 3, 4, 5, 6)
The letter **Q, q** *has also been mentioned in 28, 52, 56.*

- *The letter* **R, r** *has been mentioned in 32, 45, 53, 57.*

58. The letters **S, s (**2, 3, 4) and **T, t** (2, 3, 4, 5)
59. The letters ***S, s (****2, 3, 4) and* **xh** (2, 3, 4, 6)
*60. The letter **S, s (**2, 3, 4) and the symbol **divided by (/)** (3, 4) in the Nemeth code*
*The letter **S, s** has also been mentioned in 33, 55, 60.*

-The letter **T, t** *has been mentioned in 38, 59, 60.*

61. The letters **U, u** (1, 3, 6) *and* **X, x** (1, 3, 4, 6)
62. The letters **U, u** (1, 3, 6) *and* **Z, z (**1, 3, 5, 6)
63. The letters **U, u** (1, 3, 6) *and* **V, v** (1, 2, 3, 6)
64. The letters **U, u** (1, 3, 6) *and* **ë** (1, 6)

The letter **U, u** (1, 3, 6) *has also been mentioned in 43.*

-The letter **V, v** *has been mentioned in 46, 66.*

65. The letters **X, x** (1, 3, 4, 6) and **Y, y** (1, 3, 4, 5, 6)
66. The letters **X, x** (1, 3, 4, 6) and **q (1, 2, 3, 4, 6)**
67. The letters **X, x** (1, 3, 4, 6) and **ç** (1, 4, 6)

-The letter **X, x** *has also been mentioned in 49, 64.*

68. Braille letters **Y, y** (1, 3, 4, 5, 6) and **Z, z (**1, 3, 5, 6)
69. Braille letters **Y, y** (1, 3, 4, 5, 6) and **dh** (1, 4, 5, 6)
70. Braille letters **Y, y** (1, 3, 4, 5, 6) and **digit** (3, 4, 5, 6)
71. Braille letters **Y, y** (1, 3, 4, 5, 6) and **N** (1, 3, 4, 5)
72. Braille letters **Y, y** (1, 3, 4, 5, 6) and **Z** (1, 3, 5, 6)

The letter **Y, y** *has been mentioned previously in 50, 73.*

73. The letters **Z, z (**1, 3, 5, 6) and **ll** (1, 2, 3, 5, 6)

The letter **Z, z (**1, 3, 5, 6) *has been mentioned previously in 54, 65, 76.*

74. The letters **q** (1, 2, 3, 4, 6) and **xh** (2, 3, 4, 6)
75. The letters **q** (1, 2, 3, 4, 6) and **nj (1, 2, 4, 6)**

The letter **q** (1, 2, 3, 4, 6) *has been mentioned previously in 74*

76. Braille letters **ll** (1, 2, 3, 5, 6) and **zh** (1, 2, 5, 6)

The letter **ll** (1, 2, 3, 5, 6) *has been mentioned previously in 78, 82*

77. The letters **xh** (2, 3, 4, 6) and **th** (2, 3, 4, 5, 6)
78. The letters **xh** (2, 3, 4, 6) and **S, s** (2, 3, 4)

*The letter **th** (2, 3, 4, 5, 6) has been mentioned previously in* 70, 83, 86

79. Braille letters **ë** (1, 6) and **ç** (1, 4, 6)
80. Braille letters **ë** (1, 6) and **sh** (1, 5, 6)
81. Braille letters **ë** (1, 6) and **u** (1, 3, 6)

82. The letters **ç** (1, 4, 6) and **dh** (1, 4, 5, 6)
83. The letters **ç** (1, 4, 6) and **nj** (1, 2, 4, 6)

*The letter **ç** (1, 4, 6)* has *been mentioned previously in 13, 75*

84. The letters **dh** (1, 4, 5, 6) and **sh** (1, 5, 6)
85. The letters **dh** (1, 4, 5, 6) and **gj** (1, 2, 4, 5, 6)
86. *The letter* **dh** (1, 4, 5, 6) *has been mentioned previously in 17, 92*

87. The letters **sh** (1, 5, 6) and **zh** (1, 2, 5, 6)
*The letter **sh*** (1, 5, 6) *has been mentioned previously in* 21, 94

88. The letters **nj** (1, 2, 4, 6) and **gj** (1, 2, 4, 5, 6)
89. The letters **nj** (1, 2, 4, 6**)** and **ll** (1, 2, 3, 5, 6)
*The letter **nj** (1, 2, 4, 6)* has *been mentioned previously in …*

90. Letters **gj** (1, 2, 4, 5, 6) and **zh** (1, 2, 5, 6)
*Letter **gj** (1, 2, 4, 5, 6) has been mentioned previously in 29, 69, 84, 95, 98*

Letter **zh** *(1, 2, 5, 6)* has *been mentioned previously in 31, 85, 91, 97, 100*

******Contributions needed******
Examples may be created for every set of letters – small texts, and small passages, and songs contrasting the arpeggios and rhythmical representations of kinesthetically related Braille alphabet

Couplets of Braille letters of the Italian Braille Alphabet and punctuation signs that are kinesthetically related the dot configuration of which differs by two dots

(Couplets of Braille letters of the Italian Braille Alphabet sharing the same set of dots and one of which is represented by two additional dots**).**

It is important to stress that all couplets of Braille letters mentioned below are represented by a common set of dots. However, one letter in every couplet has, in addition to the common set, two additional dots.

1. The letters **A, a** (1) and **D, d** (1, 4, 5)
2. The letters **A, a** (1) and **L, l** (1, 2, 3)
3. The letters **A, a** (1) and **M, m** (1, 3, 4)
4. The letters **A, a** (1) and **O, o** (1, 3, 5)
5. The letters **A, a** (1) and **F, f** (1, 2, 4)
6. The letters **A, a** (1) and **H, h** (1, 2, 5)
7. The letters **A, a** (1) and **U, u** (1, 3, 6)
8. The letters **A, a** (1) and **ç** (1, 4, 6)
9. The letters **A, a** (1) and **sh** (1, 5, 6)

10. The letters **B, b** (1, 2) and **G, g** (1, 2, 4, 5)
11. The letters **B, b** (1, 2) and **P, p** (1, 2, 3, 4)
12. The letters **B, b** (1, 2) and **R, r** (1, 2, 3, 5)
13. The letters **B, b** (1, 2) and **V, v** (1, 2, 3, 6)
14. The letters **B, b** (1, 2) and **nj** (1, 2, 4, 6)
15. The letters **B, b** (1, 2) and **zh** (1, 2, 5, 6)

16. The letters **C, c** (1, 4) and **G, g** (1, 2, 4, 5)
17. The letters **C, c** (1, 4) and **X, x** (1, 3, 4, 6)
18. The letters **C, c** (1, 4) and **P, p** (1, 2, 3, 4)
19. The letters **C, c** (1, 4) and **N, n** (1, 3, 4, 5)
20. The letter **C, c** (1, 4) and **dh** (1, 4, 5, 6)
21. The letter **C, c** (1, 4) and **nj** (1, 2, 4, 6)

22. The letters **D, d** (1, 4, 5) and **Rr** (1, 2, 3, 4, 5)
23. The letters **D, d** (1, 4, 5) and **Y, y** (1, 3, 4, 5, 6)
24. The letters **D, d** (1, 4, 5) and **gj** (1, 2, 4, 5, 6)

The letter **D, d** (1, 4, 5) *has been mentioned previously in 1.*

25. The letters **E, e** (1, 5) and **Z, z** (1, 3, 5, 6)
26. The letters **E, e** (1, 5) and **R, r** (1, 2, 3, 5)
27. The letters **E, e** (1, 5) and **N, n** (1, 3, 4, 5)
28. The letters **E, e** (1, 5) and **G, g** (1, 2, 4, 5)
29. The letters **E, e** (1, 5) and **dh** (1, 4, 5, 6)
30. The letters **E, e** (1, 5) and **zh** (1, 2, 5, 6)

31. The letters **F, f** (1, 2, 4) and **r** (1, 2, 3, 4, 5)
32. The letter **F, f** (1, 2, 4) and **q** (1, 2, 3, 4, 6)
33. The letters **F, f** (1, 2, 4) and **gj** (1, 2, 4, 5, 6)
The letter **F, f** (1, 2, 4) *has been mentioned previously in 5.*

34. The letters **G, g** (1, 2, 4, 5) and **I, i** (2, 4)
The letter **G, g** *(1, 2, 4, 5) has been mentioned previously in 11, 17, 29.*

35. The letters **H, h** (1, 2, 5) and **r** (1, 2, 3, 4, 5)
36. The letters **H, h** (1, 2, 5) and **ll** (1, 2, 3, 5, 6)
37. The letters **H, h** (1, 2, 5) and **gj** (1, 2, 4, 5, 6)
The letter **H, h** (1, 2, 5) *has been mentioned previously in 6.*

38. The letters **I, i** (2, 4) and **P, p** (1, 2, 3, 4)
39. The letters **I, i** (2, 4) and **T, t** (2, 3, 4, 5)
40. The letters **I, i** (2, 4) and **xh** (2, 3, 4, 6)
41. The letters **I, i** (2, 4) and **nj** (1, 2, 4, 6)
The letter **I, i** (2, 4) *has been mentioned previously in 35.*

42. The letters **J, j** (2, 4, 5) and **r** (1, 2, 3, 4, 5)
43. The letters **J, j** (2, 4, 5) and **th** (2, 3, 4, 5, 6)
44. The letters **J, j** (2, 4, 5) and **gj** (1, 2, 4, 5, 6)

45. The letters **K, k** (1, 3) and **R, r** (1, 2, 3, 5)
46. The letters **K, k** (1, 3) and **N, n** (1, 3, 4, 5)
47. The letters **K, k** (1, 3) and **P, p** (1, 2, 3, 4)
48. The letters **K, k** (1, 3) and **X, x** (1, 3, 4, 6)
49. The letters **K, k** (1, 3) and **V, v** (1, 2, 3, 6)
50. The letters **K, k** (1, 3) and **Z, z** (1, 3, 5, 6)

51. The letters **L, l** (1, 2, 3) and **r** (1, 2, 3, 4, 5)
52. The letters **L, l** (1, 2, 3) and **q** (1, 2, 3, 4, 6)
53. The letters **, l** (1, 2, 3) and **ll** (1, 2, 3, 5, 6)
The letter **L, l** (1, 2, 3) *has been mentioned previously in 2.*

54. The letters **M, m** (1, 3, 4) and **Y, y** (1, 3, 4, 5, 6)
55. The letters **M, m** (1, 3, 4) and **r** (1, 2, 3, 4, 5)
56. The letters **M, m** (1, 3, 4) and **q** (1, 2, 3, 4, 6)
The letter **M, m** (1, 3, 4) has *been mentioned previously in 3.*

The letter N, **n** (1, 3, 4, 5) has *been mentioned previously in 20, 28, 49.*

57. The letters **O, o** (1, 3, 5) and **Y, y** (1, 3, 4, 5, 6)
58. The letters **O, o** (1, 3, 5) and **r** (1, 2, 3, 4, 5)
59. The letters **O, o** (1, 3, 5) and **ll** (1, 2, 3, 5, 6)
The letter **O, o** (1, 3, 5) *has been mentioned previously in 4*
.

60. Braille letter **P, p** (1, 2, 3, 4) has *been mentioned previously in 12, 19, 40, 50.*

61. The letters **r (1, 2, 3, 4, 5)** and **S, s** (2, 3, 4)
*The letter **r** (1, 2, 3, 4, 5) has been mentioned previously in 23, 32, 37, 45, 54, 58*

62. Braille letter **R, r** (1, 2, 3, 5) and the punctuation symbol of colon **(:)** (2, 5)
Braille letter **r** (1, 2, 3, 5) *has been mentioned previously in 13, 27, 48.*

63. The letters **S, s** (2, 3, 4) and **q** (1, 2, 3, 4, 6)
64. The letters **S, s** (2, 3, 4) and **th** (2, 3, 4, 5, 6) or the punctuation mark (**]**)(2, 3, 4, 5, 6)
The letter **S, s** (2, 3, 4) *has been mentioned previously in 66*

65. The letter **T, t** (2, 3, 4, 5) and the symbol **colon (:)** (2, 5)
66. The letter **T, t** (2, 3, 4, 5) and the symbol for division according to the Nemeth code **(:)** (3, 4)

The letter **T, t** (2, 3, 4, 5) *has been mentioned previously in 41*

67. The letters **U, u** (1, 3, 6) and **Y, y** (1, 3, 4, 5, 6)
68. The letters **U, u** (1, 3, 6) and **q** (1, 2, 3, 4, 6)
The letter **U, u** (1, 3, 6) *has been mentioned previously in 7*

69. The letters **V, v** (1, 2, 3, 6) and **ë** (1, 6)
70. *The letter* **V, v** (1, 2, 3, 6) and Braille symbol **semi-colon (;)** (2, 3)
71. *The letter* **V, v** (1, 2, 3, 6) and Braille symbol question **mark or interrogative (?)** (2, 6)
72. *The letter* **V, v** (1, 2, 3, 6) and the symbol **minus (-)** (3, 6), or **hyphen** (-) (3, 6)
The letter **V, v** (1, 2, 3, 6) *has been mentioned previously in 14, 52.*

73. The letters **X, x** (1, 3, 4, 6) and **ë** (1, 6)
74. The letter **X, x** (1, 3, 4, 6) and the symbol for **capital letters caps** (4, 6)
The letter **X, x** (1, 3, 4, 6) *has been mentioned previously in 18, 51.*

75. The letters **Y, y** (1, 3, 4, 5, 6) and **ç** (1, 4, 6)
76. The letters **Y, y** (1, 3, 4, 5, 6) and **sh** (1, 5, 6)
The letter **Y, y** (1, 3, 4, 5, 6) *has been mentioned previously in 24, 57, 61, 74.*

77. The letters ***Z, z** (1, 3, 5, 6)* and **ë** (1, 6)
78. The letter ***Z, z** (1, 3, 5, 6)* and the symbol **minus (-)** (3, 6) or **hyphen** (-) (3, 6)
*The letter **Z, z** (1, 3, 5, 6) has been mentioned previously in 26, 53.*

79. The letters **q (1, 2, 3, 4, 6)** and **ê** (1, 2, 6)

80. The letters **q (1, 2, 3, 4, 6)** and **ç** (1, 4, 6)

81. The letters **ll** (1, 2, 3, 5, 6) and **sh** (1, 5, 6)
82. *The letter* **ll** (1, 2, 3, 5, 6) *has been mentioned previously in* 38, 56, 63

83. Braille letter **th** (2, 3, 4, 5, 6) and **s** (2, 3, 4)
84. Braille letter **th** (2, 3, 4, 5, 6) and **(!)** (2, 3, 5)
85. Braille letter **th** (2, 3, 4, 5, 6) and **Quote open** (2, 3, 6)

The letter **th** (2, 3, 4, 5, 6) *has been mentioned previously in*

86. The letters **ë (1, 6)** and **dh** (1, 4, 5, 6)
87. The letters **ë (1, 6)** and **nj** (1, 2, 4, 6)
88. The letters **ë (1, 6)** and **zh** (1, 2, 5, 6)

The letter **ë (1, 6)** *has been mentioned previously in*

Braille letters **gj (1, 2, 4, 5, 6)** and **F** (1, 2, 4)
Braille letters **gj (1, 2, 4, 5, 6)** and **H** (1, 2, 5)
Braille letters **gj (1, 2, 4, 5, 6)** and **J** (2, 4, 5)
Braille letter **gj (1, 2, 4, 5, 6)** *has been mentioned previously in*

Braille letter **zh** (1, 2, 5, 6) *has been mentioned previously in*

***To be completed with the mathematical symbols as well and other symbols**

******Contribution needed******
Examples may be created for every set of letters – small texts, and small passages

Couplets of letters of the Italian Braille Alphabet
and punctuation signs that are related kinesthetically
the dot configuration of which differs by three dots

(Couplets of Braille letters of the Italian Alphabet sharing the same set of dots and one of them has three extra dots**).**

It is important to stress that all couplets of Braille letters mentioned below are represented by a common set of dots. However, one letter in every couplet has, in addition to the common set, three extra dots.

1. The letters **A, a** (1) and **G, g** (1, 2, 4, 5)
2. The letters **A, a (**1) and **N, n** (1, 3, 4, 5)
3. The letters **A, a (**1) and **P, p** (1, 2, 3, 4)
4. The letters **A, a (**1) and **R, r** (1, 2, 3, 5)
5. The letters **A, a (**1) and **V, v** (1, 2, 3, 6)
6. The letters **A, a (**1) and **X, x** (1, 3, 4, 6)
7. The letters **A, a (**1) and **Z, z** (1, 3, 5, 6)
8. The letters **A, a (**1) and **dh** (1, 4, 5, 6)
9. The letters **A, a (**1) and **nj** (1, 2, 4, 6)
10. The letters **A, a (**1) and **zh** (1, 2, 5, 6)

11. The letters **B, b (**1, 2) and **r** (1, 2, 3, 4, 5)
12. The letter **B, b (**1, 2) and **q** (1, 2, 3, 4, 6)
13. The letters **B, b (**1, 2) and **ll (1, 2, 3, 5, 6)**
14. The letters **B, b (**1, 2) and **gj** (1, 2, 4, 5, 6)

15. The letters **C, c** (1, 3) and **r** (1, 2, 3, 4, 5)
16. The letters **C, c** (1, 3) and **Y, y** (1, 3, 4, 5, 6)
17. The letter **C, c** (1, 3) and **q** (1, 2, 3, 4, 6)
18. The letter **C, c** (1, 3) and **ll** (1, 2, 3, 5, 6)

19. The letters **E, e** (1, 5) and **Y, y** (1, 3, 4, 5, 6)
20. The letters **E, e** (1, 5) and **Rr** (1, 2, 3, 4, 5)
21. The letters **E, e** (1, 5) and **ll** (1, 2, 3, 5, 6)
22. The letters **E, e** (1, 5) and **q** (1, 2, 3, 4, 6)

23. The letters **I, i** (2, 4) and **r** (1, 2, 3, 4, 5)
24. The letters **I, i** (2, 4) and **q** (1, 2, 3, 4, 6)
25. The letters **I, i** (2, 4) and **th** (2, 3, 4, 5, 6)
26. The letter **I, i** (2, 4) and **gj** (1, 2, 4, 5, 6)

27. The letters **K, k** (1, 3) and **Y, y** (1, 3, 4, 5, 6)
28. The letters **K, k** (1, 3) and **ll** (1, 2, 3, 5, 6)
29. The letters **K, k** (1, 3) and **q** (1, 2, 3, 4, 6)
30. The letters **K, k** (1, 3) and **r** (1, 2, 3, 4, 5)

*Braille letter **r** (1, 2, 3, 4, 5) has been mentioned previously in*

31. *The letter* **V, v** (1, 2, 3, 6) and the punctuation mark **comma (,)** (2)
32. The letter **V, v** (1, 2, 3, 6) and **(')** (3)
33. The letter **V, v** (1, 2, 3, 6) *has been mentioned previously in 5*

34. *The letter* **X, x** (1, 3, 4, 6) and the symbol **inverted comma (')** (3)
The letter **X, x** (1, 3, 4, 6) *has been mentioned previously in 6*

35. The letters **Y, y** (1, 3, 4, 5, 6) and **ë** (1, 6)
36. *The letter* **Y, y** (1, 3, 4, 5, 6) and right bracket **())**(3, 5)
37. *The letter* **Y, y** (1, 3, 4, 5, 6) and the symbol **minus (-)** (3, 6) or **hyphen** (-) (3, 6)
38. *The letter* **Y, y** (1, 3, 4, 5, 6) and the **symbol for capital letters caps** (4, 6)

The letter **Y, y** (1, 3, 4, 5, 6) *has been mentioned previously in 16, 19, 27*

39. *The letter* **Z, z** *(1, 3, 5, 6)* and **(')** (3)
The letter **Z, z** *(1, 3, 5, 6) has been mentioned previously in 7*

40. The letters **q** (1, 2, 3, 4, 6) and **ë** (1, 6)

The letter **q** (1, 2, 3, 4, 6) has *been mentioned previously in 12, 17, 22, 24, 29*

41. Braille letters **ll** (1, 2, 3, 5, 6) and **ë** (1, 6)
42. Braille letters **ll** (1, 2, 3, 5, 6) and **b** (1, 2)
43. Braille letters **ll** (1, 2, 3, 5, 6) and k (1, 3)
44. Braille letters **ll** (1, 2, 3, 5, 6) and **E** (1, 5)
45. Braille letters **ll** (1, 2, 3, 5, 6) and **(;)** (2, 3)
46. Braille letters **ll** (1, 2, 3, 5, 6) and (**?**)(2, 6)
47. Braille letters **ll** (1, 2, 3, 5, 6) and (**:**)(2, 5)
48. Braille letters **ll** (1, 2, 3, 5, 6) and **minus (-)** (3, 6)

The letter **ll** (1, 2, 3, 5, 6) *has been mentioned previously in …*

49. *Braille letter* **xh** (2, 3, 4, 6) and **comma (,)** (2)
50. *Braille letter* **xh** (2, 3, 4, 6) and the symbol **inverted comma (')** (3)

51. *Braille letter* **th** (2, 3, 4, 5, 6) and **(?)**(2, 6)
52. *Braille letter* **th** (2, 3, 4, 5, 6) and the symbol **minus (-)** (3, 6) or **hyphen** (-) (3, 6)
53. *Braille letter* **th** (2, 3, 4, 5, 6) and the symbol for **capital letters caps** (4, 6)
54. *The letter* ***th*** *(2, 3, 4, 5, 6)* and **semi-colon (;)** (2, 3)
55. *The letter* ***th (2, 3, 4, 5, 6)*** and **colon (:)** (2, 5)
56. *The letter* **th** (2, 3, 4, 5, 6) *has been mentioned previously in 25*

57. Braille letters **ë** (1, 6) and **gj** (1, 2, 4, 5, 6)

Braille *letter* **ë** (1, 6) *has been mentioned previously in*

Braille *letter **ç** (1, 4, 6) has been mentioned previously in 49*

Braille *letter **û*** (1, 5, 6) has *been mentioned previously in 50*

58. Braille *letter* **nj** (1, 2, 4, 6) and the symbol **comma** (**,**) (2)
Braille *letter* **nj** (1, 2, 4, 6) has *been mentioned previously in 9*

59. Braille *letter* **gj** (1, 2, 4, 5, 6) and the symbol for **capital letters caps** (4, 6)

The letter **zh** (1, 2, 5, 6) *has been mentioned previously in 10*

Vertically symmetric Albanian Braille characters

For every couplet of the letters, word examples including the two (2) symbols or small expressions – phrases with the two symbols may be provided

F, f (1, 2, 5)

.	.
.	

D, d (1, 4, 5)

.	.
	.

Examples: Fadomas

E, e (1, 5)

.	
	.

i (2, 4)

	.
.	

Examples:

H, h (1, 2, 5)

.	
.	.

J, j (2, 4, 5)

	.
.	.

Examples:

M, m (1, 3, 4)

.	.
.	

ç (1, 4, 6)

.	.
	.

Examples:

Y, y (1, 3, 4, 5, 6)

.	.
	.
.	.

q (1, 2, 3, 4, 6)

.	.
.	
.	.

Examples:

Z, z (1, 3, 5, 6)

.	
	.
.	.

sh (2, 3, 4, 6)

	.
.	
.	.

Examples:

ll (1, 2, 3, 5, 6)

.	
.	.
.	.

th (2, 3, 4, 5, 6)

	.
.	.
.	.

Examples:

dh (1, 4, 5, 6)

.	.
	.
	.

P, p (1, 2, 3, 4)

.	.
.	
.	

Examples:

S, s (2, 3, 4)

	.
.	
.	

sh (1, 5, 6)

.	
	.
	.

Examples:

N, n (1, 3, 4, 5)

.	.
	.
.	

nj (1, 2, 4, 6)

.	.
.	
	.

Examples:

Rr (1, 2, 3, 4, 5)

.	.
.	.
.	

gj (1, 2, 4, 5, 6)

.	.
.	.
	.

Examples:

zh (1, 2, 5, 6)

.	
.	.
	.

T, t (2, 3, 4, 5)

	.
.	.
.	

Examples:

Letters of the Italian Braille alphabet that have a symmetrical relationship in relation to the middle horizontal line of the Braille cell

M, m (1, 3, 4)

.	.
.	

U, u (1, 3, 6)

.	
.	.

N, n (1, 3, 4, 5)

.	.
	.
.	

Z, z (1, 3, 5, 6)

.	
	.
.	.

P, p (1, 2, 3, 4)

.	.
.	
.	

V, v (1, 2, 3, 6)

.	
.	
.	.

Rr (1, 2, 3, 4, 5)

.	.
.	.
.	

ll (1, 2, 3, 5,6)

.	
.	.
.	.

th (2, 3, 4, 5, 6)

	.
.	.
.	.

gj (1, 2, 4, 5, 6)

.	.
.	.
	.

zh (1, 2, 5, 6)

.	
.	.
	.

T, t (2, 3, 4, 5)

	.
.	.
.	

xh (2, 3, 4, 6)

	.
.	
.	.

nj (1, 2, 4, 6)

.	.
.	
	.

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Albanian Braille Alphabet

a (1)

b (1, 2)

c (1, 4)

ç (1, 4, 6)

d (1, 4, 5)

dh (1, 4, 5, 6)

e (1, 5)

ë (1, 6)

f (1, 2, 4)

g (1, 2, 4, 5)

gj (1, 2, 4, 5, 6)

h (1, 2, 5)

i (2, 4)

j (2, 4, 5)

k (1, 3)

l (1, 2, 3)

ll (1, 2, 3, 5, 6)

m (1, 3, 4)

n (1, 3, 4, 5)

nj (1, 2, 4, 6)

o (1, 3, 5)

p (1, 2, 3, 4)

rr (1, 2, 3, 4, 5)

r (1, 2, 3, 5)

rr (1, 2, 3, 4, 5)

s (2, 3, 4)

sh (1, 5, 6)

t (2, 3, 4, 5)

th (2, 3, 4, 5, 6)

u (1, 3, 6)

v (1, 2, 3, 6)

x (1, 3, 4, 6)

xh (2, 3, 4, 6)

y (1, 3, 4, 5, 6)

z (1, 3, 5, 6)

zh (1, 2, 5, 6)

APPENDIX 2

Punctuation

(,) (2)

.	

(.) (2, 5, 6)

.	.
	.

(;)(2, 3)

.	
.	

(?)(2, 6)

.	
	.

(!) (2, 3, 5)

.	.
.	

(-)(3, 6)

.	.

’ (3)

.	

Quote open “ (2, 3, 6)

.	
.	.

Quote close ”(3, 5, 6)

	.
.	.

() (2, 3, 5, 6)

.	.
.	.

Formatting

Digit (3, 4, 5, 6)

	.
	.
.	.

Caps (4, 6)

	.
	.

Numbers according to the Nemeth code

The Numerical Symbol (3, 4, 5, 6) is written in front of every number

	.
	.
.	.

1 (1)

.	

2 (1, 2)

.	
.	

3 (1, 4)

.	.

4 (1, 4, 5)

.	.
	.

5 (1, 5)

.	
	.

6 (1, 2, 4)

.	.
.	

7 (1, 2, 4, 5)

.	.
.	.

8 (1, 2, 5)

.	
.	.

9 (2, 4)

	.
.	

0 (2, 4, 5)

	.
.	.

(+) (2, 3, 5)

.	.
.	

(-) (3, 6)

.	.

(X) (2, 3, 6)

.	
.	.

(:) (2, 5, 6)

.	.
	.

(=) (2, 3, 5, 6)

.	.
.	.

(>) (3, 4, 5)

	.
	.
.	

(<) (1, 2, 6)

.	
.	
	.

(^{0}) (2, 5, 6)

	.
.	.

(%) (4, 6)

	.
	.

<u>Couplets of Braille letters of the Albanian alphabet and punctuation signs that have a complementary relationship (are written in a complementary manner) in relation to the full Braille cell</u>

a (1)

.	

th (2, 3, 4, 5, 6)

	.
.	.
.	.

b (1, 2)

.	
.	

The numerical symbol – digit (3, 4, 5, 6)

	.
	.
.	.

c (1, 4)

.	.

Brackets (()) (2, 3, 5, 6)

.	.
.	.

d (1, 4, 5)

.	.
	.

Quote open (2, 3, 6)

.	
.	.

xh(2, 3, 4, 6)

	.
.	
.	.

e (1, 5)

.	
	.

f (1, 2, 4)

.	.
.	

Quote close (3, 5, 6)

	.
.	.

g (1, 2, 4, 5)

.	.
.	.

hyphen (-) (3, 6) and **minus (-)** (3, 6)

.	.

j (1, 4, 5)

	.
.	.

u (1, 3, 6)

.	
.	.

m (1, 3, 4)

.	.
.	

Point (.) (2, 5, 6)

.	.
	.

n (1, 3, 4, 5)

.	.
	.
.	

Question mark (?) (2, 6)

.	
	.

i (2, 4)

	.
.	

z (1, 3, 5, 6)

.	
	.
.	.

ë (1, 6)

.	
	.

t (2, 3, 4, 5)

	.
.	.
.	

s (2, 3, 4)

	.
.	
.	

sh (1, 5, 6)

.	
	.
	.

r (1, 2, 3, 5)

.	
.	.
.	

Caps (4, 6)

	.
	.

x (1, 3, 4, 6)

.	.
.	.

(:) (2, 5)

.	.

y (1, 3, 4, 5, 6)

.	.
	.
.	.

(,) (2)

.	

ç (1, 4, 6)

.	.
	.

Exclamation mark (!) (2, 3, 5)

.	.
.	

dh (1, 4, 5, 6)

.	.
	.
	.

(;) (2, 3)

.	
.	

gj (1, 2, 4, 5, 6)

.	.
.	.
	.

(') (3)

.	