MOTOR LEARNING IN SPECIAL EDUCATION NEEDS

APPRENDIMENTO MOTORIO NEI BISOGNI EDUCATIVI SPECIALI

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ABSTRACT

The aim of the contribution is to illustrate the link between sign language learning and physical literacy through the concept of motor learning and motor skills. Through a research project, an attempt was made to understand and investigate how coordinative aspects have a more or less pronounced influence on sign language learning and consequently on the motor learning carried out through it.

L'obiettivo del contributo è illustrare il legame esistente tra l'apprendimento della lingua dei segni e la physical literacy, attraverso il concetto di apprendimento ed abilità motoria. Attraverso un progetto di ricerca si è cercato di comprendere ed approfondire come gli aspetti coordinativi incidano in maniera più o meno marcata sull'apprendimento della lingua dei segni e di conseguenza sull'apprendimento motorio effettuato attraverso di essa.

KEYWORDS
Sign language, motor learning, physical literacy, teaching –learning process
Lingua dei segni, apprendimento motorio, alfabetizzazione motoria, processi di insegnamento -apprendimento

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Introduction

In the context of the relationship between motor literacy and non-verbal communication, the concept of motor learning is particularly interesting as motor literacy implies, by definition, the acquisition and mastery of basic motor skills (Carmona López et al., 2023). This motor learning process finds ample room for discussion and investigation when placed in the context of certain disabilities, specifically hearing disabilities. The origin of deafness can be congenital or acquired, but a first fundamental subdivision of the types of deafness concerns the location of the damage that leads to the consequent hearing loss, so it is usual to distinguish between transmissive deafness, perceptual deafness and mixed deafness. That said, the lack of hearing can potentially create risky situations regarding the development of language and communicative processes (Al-Hammadi et al., 2019). The first challenge for deaf people is therefore the acquisition of language, or rather language for the purpose of communication. It is for this reason that it is important to distinguish between learning sign language and learning a spoken language. As mentioned earlier, in the field of non-verbal communication, the concept of motor learning, which is connected to the whole area of non-linguistic communication (posture, gestures and signs), appears to be a useful and fertile research ground (Wadhawan, & Kumar, 2021). Studies on the correlation between motor learning, motor literacy and non-verbal communication seem to be rather heterogeneous, although in principle it is possible to group them into a few specific macro-areas. First of all, in order to fully frame the concept of motor literacy, it is essential to consider the studies by Whitehead (2010) and Cairney (2019) and subsequently follow the implications of motor literacy in various areas of social life such as public health and education (Cornish et al., 2020; Rudd et al., 2020). There is also an abundance of views related to the purely psychological and cognitive aspects of non-verbal communication (Bramlett T., 2020), passing also through a purely motor strand of learning (Colella, 2018; Colella, & Bonasia, 2019; Colella, D'Arando, & Bellantonio, 2020; Monacis, & Colella, 2022; Whitehead, 2019), to finally find the *trait d'union* of the strands first described, in sign languages and specifically in Italian sign language (Roccaforte, 2018). In this regard, sign languages are complex and natural linguistic systems used by deaf people to communicate. These systems rely on hand gestures, facial expressions and body movements to convey concepts, ideas and emotions. Sign languages have a distinctive grammatical structure and a unique vocabulary, like vocal languages. Thus, it is also possible to communicate through body expressions, gestures, looks, moods and experiences. Communication thus represents a sharing, a transfer of content through a channel, the proxemic channel. Semiotics is thus the field of

study of signs and according to the structuralist conception, a linguistic sign combines a concept with an acoustic image, forming a mental entity (Radovanović, Radić-Šestić, & Milanović-Dobrota, 2016). And it is precisely in this territory of sign language, halfway between motor literacy and non-verbal communication, that the contributions on the subject of sign language learning itself as purely motor, physical and coordinative learning seem apparently limited, an area in which the present research proposal, a continuation and in-depth study of a previous pilot project (Scamardella et al., 2023), will be inserted. The aim of the contribution will therefore be to investigate the link existing between the learning of sign language or, to put it better, of a marked language and its more explicitly motor part, linked mostly to the acquisition of the signs themselves, of gestures that have as their ultimate goal a "meaning", from global and postural movement, intrinsically connected to the basis of future communication linked to the language itself.

1. Literature background

Scientific contributions (RCTs) related to the last five years were taken into account, thus starting from 2019, excluding review articles, meta-analyses and unpublished studies from the analysis. The main academic databases were consulted (PubMed, Google Scholar, Cochrane Library, Embase, and Web of Science), which collectively tend to summarise the chosen topic through three particularly useful perspectives. On the one hand, there are research strands purely related to the motor area and the semantic or psychological aspects of non-verbal communication. On the other, we find the main studies and research on motor learning, motor literacy, sign languages and aspects of non-verbal communication. Certainly, as described above, it is essential to go through the contributions of Cairney (2019) and Whitehead (2010) to understand and define the very concept of motor literacy. In the following years, then, the idea of physical literacy has gained considerable importance in the fields of education, sport, physical activity, leisure and public health, as shown by the studies of Rudd (2020) and Durden-Myers et al. (2018). Also noteworthy is the contribution of Shearer et al. (2018) that frames the concept of motor literacy in its teaching and operational practices. A further line of research fundamentally emphasises how, in both sign language and non-verbal communication, the visual - gestural aspect and thus purely oculo-manual coordination and mimicry and gestural skills (Colella, 2018) are crucial for successful non-verbal communication. Further supporting these hypotheses is the work of Aiello (2012) in which it is argued that movement is the basis for all language learning. Another point of view from these sources concerns the semantic aspects

related to the meaning of communication and non-verbal communication. Non-verbal communication always possesses a component of multimodality (Sindoni, 2022), a component that sees the meaning of a communication passing mainly through motor and non-verbal aspects. In the wake of what has just been stated is the work of Sgambelluri (2017), according to whom the body performs cognitive and social functions simultaneously, becoming the *trait d'union* for the entire communicative process. Such sources reinforce and actualise Watzlawick's (1978) enunciation of the entire communicative process and the pragmatics of communication.

2. Methodology

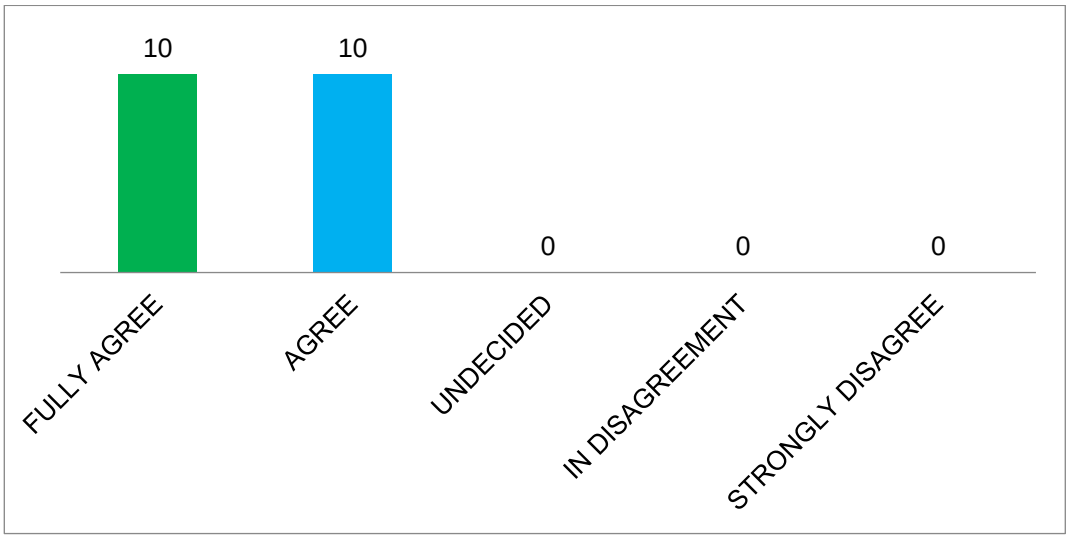
The teaching of Italian sign language (ILS) requires specific approaches to help learners communicate through sign language instead of using spoken language. Among the most frequently used methodologies is the visual-gestural method. This method is the most natural and common method for teaching sign languages. Teachers use signs and gestures to communicate, emphasising body language and facial expressions to convey meaning, giving meaning to non-verbal communication. The research proposal was initiated by administering a questionnaire to a class of B1-level students of an Italian sign language course. An attempt was made to observe and verify whether techniques and knowledge from the motor and sports spheres related to motor literacy could be superimposed and reused to learn the signs of sign language, in a rapid and incisive manner, for the purpose of non-verbal communication. The questionnaire was based on a 5-point Likert scale, with the following response options: strongly agree, agree, undecided, disagree, strongly disagree. The issue analysed in the context of the relationship between neuroscience and learning was the study of sign languages and, specifically, motor learning of Italian sign language. The research questions followed the following outline: Is it possible to learn sign language in the same way as any motor learning? Is it then possible to standardise such sign language as any motor learning? Is it possible to superimpose aspects of non-verbal communication on the non-manual components (NMC) of sign language? Finally, can motor learning and all the coordinative aspects related to it help sign language learning? In order to test these hypotheses, i.e. whether there is an overlap of timing and dynamics in sign language learning exactly as described in Meinel and Schnabel's (1976) model, the following steps were taken. First of all, a questionnaire was administered to students of an Italian Sign Language Level B1 course, a sample of

20 units, equally divided by gender (10 male, 10 female), aged between 19 and 40, with an average age of 30. The questionnaire consisted of 10 *items*, composed as follows, all in line with the Likert scale:

1. To learn a marked language, it is essential to learn to coordinate several body movements together.
2. To learn a marked language, it is essential to learn to relate the movements of the upper limbs, including the hands, to the visual field.
3. To learn a sign language, it is essential to learn to order signs sequentially.
4. To learn a marked language, it is essential to learn how to manage the right amount of force in order to execute the signs accurately.
5. To learn a sign language, it is essential to learn to perform the beginning of the sign as quickly as possible.
6. To learn a sign language, it is essential to learn to adapt and modify the specific time and rhythm of each sign.
7. To learn a sign language, it is essential to maintain a stable spatial orientation with reference to the sign being performed.
8. To learn a marked language, it is essential to be able to make movements one was previously unable to realise.
9. To learn a sign language, it is essential to organise the signs in advance so that they are realised correctly.
10. To learn a marked language, it is essential to modify the marked language, if necessary, to cope with unforeseen situations.

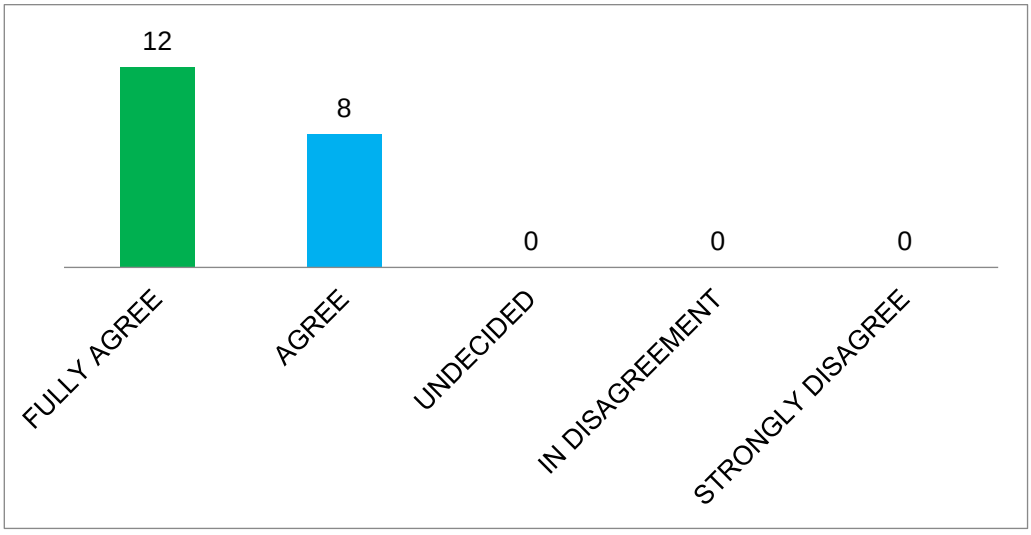
3. Results and Discussion

As far as the results are concerned, the data for each *item* will be reviewed. In question number one, 50% of the sample fully agreed with the starting statement and 50% agreed. There are no undecided or dissenting opinions.



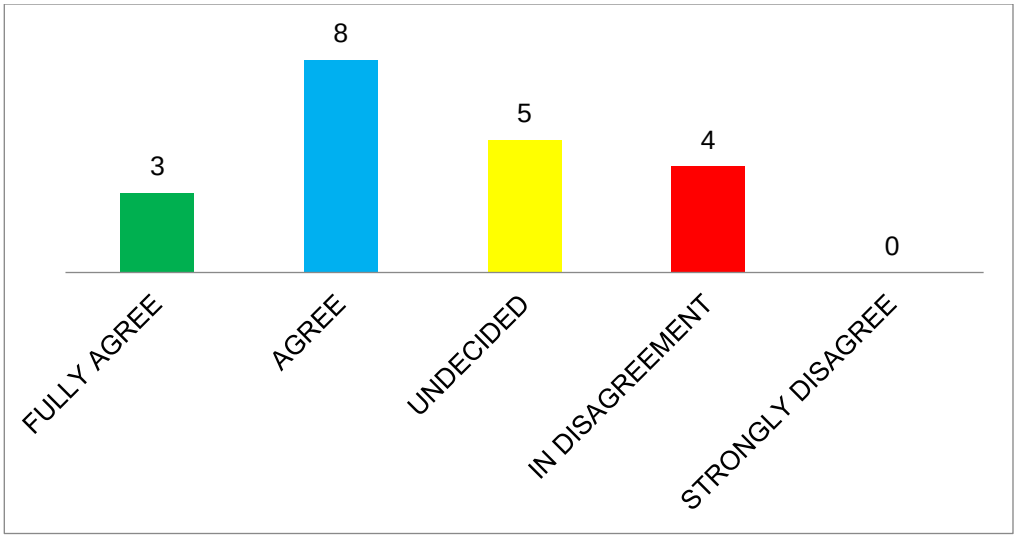
Graph. 1 (Motor and language combination marked)

With regard to the discussion of the results obtained, in the first *item* there is practically the entire sample that agrees or strongly agrees with the starting statement. This could imply that in order to learn a marked language, it is essential to coordinate several movements together: torso, hands via head movements and not least facial expressions. Apparently, this *item* is perfectly in line with the starting hypothesis. Concerning question number two, 60% strongly agree and another 40% agree. Again, there are no undecided or dissenting opinions.



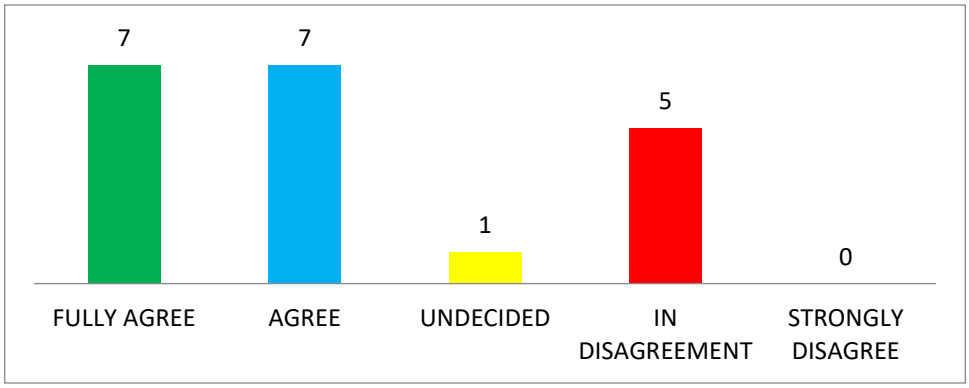
Graph.2 (Spatio-temporal orientation and marked languages)

In this *item,* most of the sample agrees that it is essential to relate the movements of the upper limbs and thus of the hands to one's visual field. This factor highlights the importance of oculo-hand and visual-spatial coordination in a manner consistent with the research hypotheses outlined above. On *item* number three, 40% agreed, 15% strongly agreed, 25% were undecided and 20% disagreed.



Graph. 3 (Motor differentiation and marked languages)

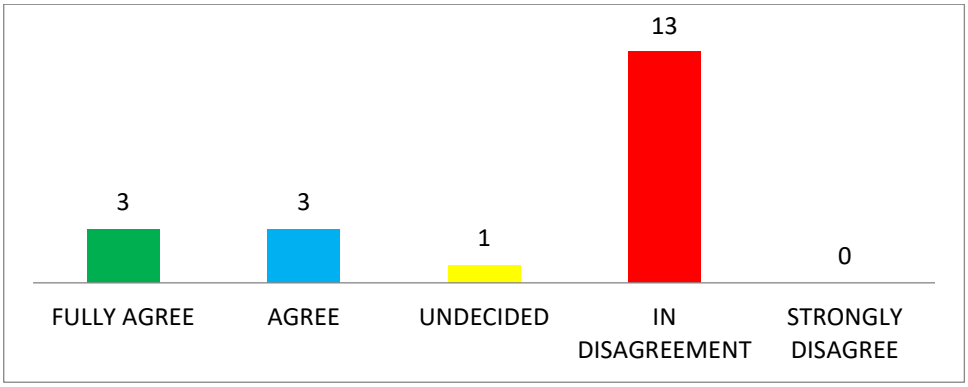
On *item* number four, 35% strongly agreed with another 35% agreeing, while 25% disagreed, with 5% undecided.



Graph. 4 (Motor differentiation and marked languages)

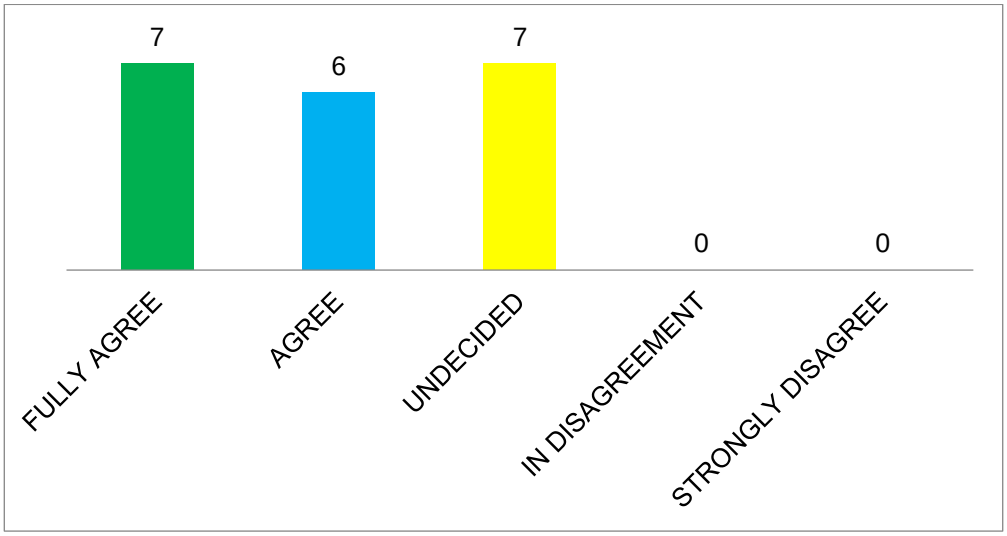
In *item* three, too, most of the sample, 55%, appears to be in favour of the starting statement. This would imply from a coordinative point of view to differentiate the

movement in a pertinent way in time, a factor that added to the 70% in favour of item number four, would confirm the choices of item number three adding value to what was stated; to "mark" correctly it would seem fundamental from a coordinative point of view to differentiate the right amount of muscular strength to execute the marks with precision, at the right time. It is also true, however, that between the third and fourth *items* there are 45% of respondents who disagree with both statements. This would logically seem to imply that the coordination factors linked to motor differentiation are not relevant to the learning of a marked language and thus to the correct execution of the signs themselves. With reference to the starting hypotheses, these *items* are still in line with them, albeit with an important opposition. Question five shows 65% disagreeing, followed by 15% strongly agreeing, 15% agreeing and yet another 5% undecided. None strongly disagree.



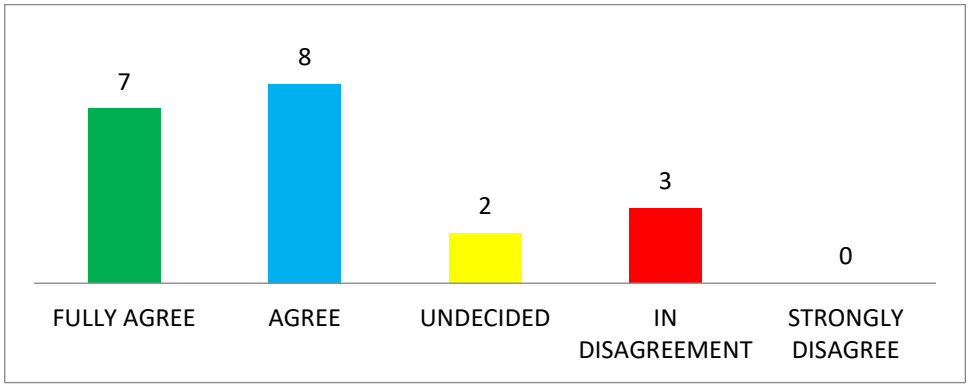
Graph. 5 (Motor anticipation and marked languages)

Regarding *item* number five, the majority of the sample (70%) does not consider it important and therefore fundamental for learning sign languages to start a sign as quickly as possible. This figure implies that the coordination aspect, which underlies the ability to react and anticipate, is not peremptory and prioritised in the execution of the sign itself. It is evident that the data do not overlap with the starting hypotheses. The sixth question, number six, sees 35% strongly agree, followed by 30% agree and 35% undecided. No one disagrees or strongly disagrees.



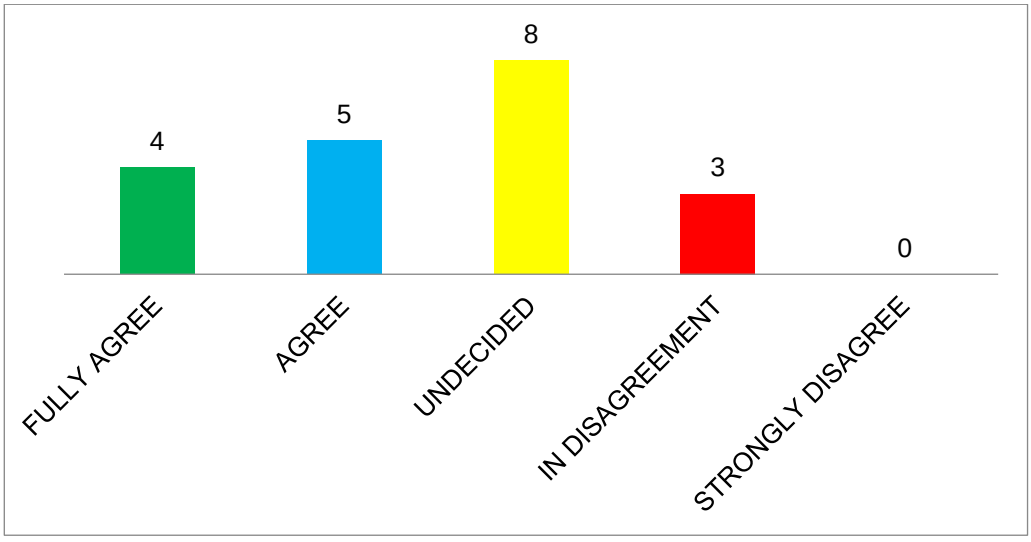
Graph. 6 (Capacity for rhythm and marked languages)

In the sixth question, 65% of the sample agreed (agree/strongly agree) that the rhythm with which signs are scanned is of fundamental importance for learning a sign language. This is in line with what is referred to in the literature as communication tempo, as a pivotal element of paraverbal communication (Watlazick, 1978), along with tone and volume. Apparently, therefore, the sample also consistently veers towards the starting hypothesis in this *item*. This statement is also supported by the fact that the remaining 35% were undecided as there was no one in opposition (disagree/strongly disagree). On *item* seven, the majority of the sample is in favour of the statement; 75% strongly agree or agree. 15% disagreed while 10% were undecided. None strongly disagree.



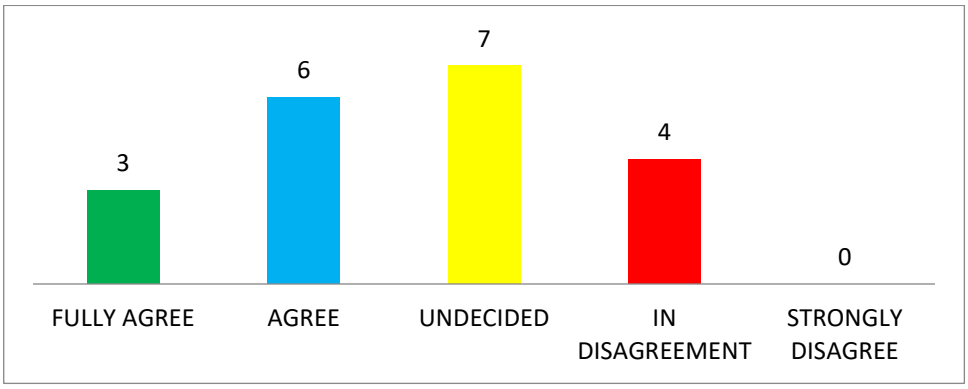
Graph. 7 (Balancing skills and marked languages)

On the seventh question, 75% of the sample therefore agreed with the original statement. 15% disagree while 10% are undecided. Again, the 75% in favour suggests that it is essential in marking to maintain a stable spatial orientation. This is technically in keeping with the so-called 'quadrant' of the sign, i.e. that imaginary space above the navel line and below the chin, formed by the breadth of the shoulders, where precisely to mark. Not to be underestimated, however, is the percentage of naysayers and undecideds, 25% in all, who see the hypotheses as overlapping. On question number eight, 20% of the sample totally agree 25% agree with the starting item, the undecided are 15%, while 40% disagree. None strongly disagree.



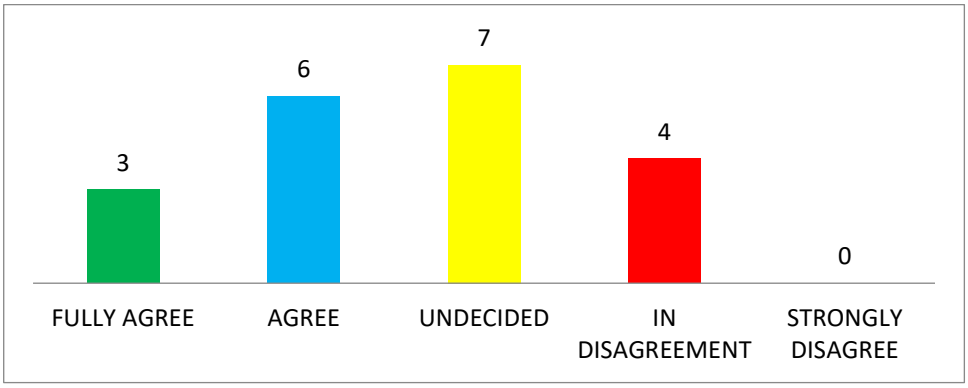
Graph. 8 (Motor learning and sign language)

The data for *item* 8 are particularly discordant; 45% support the statement while 55% disagree or are undecided. Approximately half of the sample believes that in order to learn a marked language, it is necessary to learn new movements (signs and all that goes with them), which one did not previously possess and was not able to realise. The other half of the sample believes that such movements are already in the possession of the “signers” and therefore other factors are necessary and decisive for learning. Thus, hypotheses partially overlapping with the data. *Item* number nine sees the sample fully agreeing (15%), followed by 30% agreeing and 35% undecided. 20% disagree. None strongly disagree.



Graph. 9 (Motor control and marked languages)

In question nine, the majority of the sample (45%) is in favour of the starting statement that has coordinative motor control as its theoretical reference, understood as general coordinative ability (Melone, 2023). However, 55% are unfavourable, with undecided (35%) and disagreeing (20%). Apparently, the item answers are not relevant to the initial hypothesis. Finally, in question ten, 30% agree almost as well as the undecided (35%). 15% of the respondents strongly agree, followed by 20% disagree. Again, no one strongly disagrees.



Graph. 10 (Motor adaptation and transformation and marked languages)

In this *item*, the sample is again divided into those in favour (45%) and those undecided/disagreeing (55%). This finding concerning the so-called coordinative capacity for adaptation and transformation (*Annoscia, & Colella, 2024*) brings us partly back to the considerations concerning question number eight. Approximately half of the sample agrees that, as happens in verbal communication, it is probably necessary to “modify” the words one uses, the tone and the volume on the run as a function of the dynamics of communication. Thus, in parallel, this may also be the

case in marked languages. The other half of the sample, on the other hand (although the undecided are the majority), probably believes that in marked languages it is not possible or necessary to make running corrections. In any case, however, the data/assumptions are only partially overlapping.

Conclusions

Theoretically speaking, studies on the relationship between motor learning, motor literacy and sign languages in the context of non-verbal communication would seem to merit further in-depth investigation, but it is possible to state that the initial hypotheses have been partially fulfilled. Indeed, it seems inseparable from the discussion of the data that the symbiosis of body - non-verbal communication passes through motor learning and thus there can be no learning of a sign language beyond any semantic aspect without motor learning first. Investigations into Sign Language Acquisition have enriched our understanding of how people acquire and develop the ability to communicate through sign language rather than spoken language. These insights focus on various aspects of sign language learning by first outlining that there is a sensitive period for sign languages as well. Similarly to the learning of spoken languages, there is presumably a sensitive period in which the assimilation of sign language is most effective. In addition, some signs in sign language are iconised, i.e. they have a rather clear visual form that refers to their meaning. Scientific investigations have explored how people learn and understand these signs and how this ability affects overall language absorption. Finally, it is worth emphasising as previously stated that if there are sensitive periods, there is an influence of age on learning. Age can affect the ability to achieve innate mastery of sign language. Having said this, the limitations of the research exist and are to be found in the quantitative field; the number of the project sample is still limited and it is this factor that apparently holds back the knowledge process in this field. Obviously, the gap considered in terms of numbers should be seen in the light of the continuation of the work started with the previous pilot project (Scamardella et al, 2023), and even in this case it can become an opportunity for possible future developments on the same methodological basis. Enlarging the sample further from a numerical point of view would lead to even greater qualitative knowledge of the aspects considered so far, although the audience of marked language professionals and novices would appear to be limited. Even administering the same questionnaire to further advanced sign language learners would be a useful process for the research objectives analysed. Again, it would be possible with the same methodology to submit the items also and above all to a deaf community.

Therefore, with the last observations starting from this contribution, it is plausible to realise and further develop the starting hypotheses, adding a further contribution to the link between motor literacy, motor learning and sign languages.

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