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EDITED BY
Victoria Marrero-Aguiar,
National University of Distance Education (UNED), Spain

REVIEWED BY
Ronald Leow,
Georgetown University, United States
Carmen Aguirre,
Complutense University of Madrid, Spain

*CORRESPONDENCE
Sara Feijoo
✉ sfeijoo@ub.edu

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Multimodal input in the foreign language classroom: the use of hand gesture to teach morphology in L2 Spanish

Sara Feijoo[1]* and Mariona Anglada[2]

[1]Department of Modern Languages and Literatures and English Studies, Universitat de Barcelona, Barcelona, Spain, [2]Department of Psychology and Education Sciences, UOC, Barcelona, Spain

Many studies describe the benefits of morphological awareness in reading comprehension in both first and second languages. In turn, several studies demonstrate the positive impact of multimodal input while learning. In this study, we looked for a relationship between multimodal input, gesture in particular, and the development of morphological awareness in L2 Spanish. An experiment was carried out with 38 students of L2 Spanish, aged between 14 and 16, from a secondary school in the UK. The experiment consisted of a pretest and a posttest of morphological awareness mediating three sessions of training. During the training sessions, the participants were divided into 4 groups with different input modalities: audiovisual, audiovisual with text enhancement, audiovisual-gestural and control. Participants worked on a series of words with a morphemic component through the visualization of videos. The experiment provided significant results in terms of learning from pre- to post-test in one of the groups, the audiovisual-gestural group. Hence, we conclude that, in the short term, this type of training might have a positive impact on the development of morphological awareness.

KEYWORDS

multimodal input, morphological awareness, gesture, foreign language learning, L2 Spanish

1 Introduction

The present study explores the relationship between morphological awareness (MA) and multimodality in the foreign language classroom. Morphological awareness has been defined as learners' conscious awareness of the morphemic structure of words and the ability to manipulate this structure (Carlisle, 2000). Unlike morphological knowledge (i.e., the ability to comprehend and produce morphologically complex words), morphological awareness is the metalinguistic ability to manipulate word formation rules (Kuo and Anderson, 2006). Several studies point out that MA impacts on the comprehension of complex words and, therefore, on reading comprehension (Carlisle, 2000, 2003) and written production (García and González, 2006; Sánchez-Gutiérrez et al., 2020).

Given the impact of MA on the successful development of reading skills, recent research has highlighed the benefits of MA training both among L1 and L2 learners in a number of different languages. For instance, Lyster et al. (2016) evaluated the short- and long-term effect of morphological training in Norwegian preschool children and found evidence of improvement in reading comprehension test scores both 1 year and 6 years after the training. In a study on MA among Italian monolinguals and Arabic-Italian bilinguals, Vernice and Pagliarini (2018)

concluded that working on MA explicitly at school provides significant improvements in reading comprehension, but that we cannot assume that MA is automatically transferred from L1 to L2, nor that in an L2, even if introduced early, the development MA will be implicit. In the context of Korean learners (L1) learning English (L2), Kim (2019) concluded that it was MA work that contributed to the improvement of reading comprehension and vocabulary knowledge in L2 English for these Korean learners. Kieffer and Lesaux (2008) presented a similar situation with Spanish (L1).

speakers learning English (L2). This study concluded that MA at the derivational level was an important factor in the development of reading skills, and that it was from age 10 onwards that a clear and increasing correspondence between MA and reading comprehension was developed.

Thus, the empirical evidence available so far seems to agree on two aspects: on the one hand, we cannot assume implicit learning of the complexities of the morphological system in any language, regardless of its level of transparency or morphological complexity (Carlisle and Goodwin, 2013; Vernice and Pagliarini, 2018). On the other hand, studies carried out so far show a benefit in explicit MA training, especially in early stages of language learning (Kieffer and Lesaux, 2008; Lyster et al., 2016; Sánchez-Gutiérrez et al., 2020).

Regarding multimodality, the second factor under exploration in the present study, since Paivio's (1991) proposal of the Dual Coding Theory, the advantages of multimodal input have been highlighed in a number of studies. For instance, previous literature has shown the benefits of multimodal input for the acquisition of new phonological categories (Hazan et al., 2006; Ter Schure et al., 2016). Other studies have also pointed to the benefits of multimodal or audiovisual input for word learning in a second language (e.g., Bird and Williams, 2002; Peters and Webb, 2018; Montero-Perez, 2020) or even the development of L2 grammar (Pattemore and Muñoz, 2020).

A particular form of multimodal input that has been described to facilitate communication and processing is the combination of language (oral input) and the so-called co-speech gesture (visual information). In their seminal paper on the use of gesture in the mathematics classes, Goldin-Meadow et al. (1999) drew attention to how teachers recurrently and unconsciously used gestures to present problem-solving strategies and, most importantly, that students not only noticed those gestures but also benefited from them during and after class.

Since then, many different studies have highlighted the importance of visual information (i.e., gesture) in conveying a message through conversation, the high perceptual sensitivity that speakers exhibit towards gesture when it accompanies speech, and the way speech and gesture complement each other (McNeill, 2005; Bernardis and Gentilucci, 2006; Drijvers and Özyürek, 2017; Crimon et al., 2022; Feijoo et al., 2023). Esteve-Gibert (2016) emphasized the relevance of the integration between gesture and speech and how, as early as 9 months of age, infants are able to perceive alterations in the synchronicity between the two. In a similar line, Igualada et al. (2017) showed the benefits of using non-verbal language to convey linguistic information to preschool children, and the capacity that children have to remember words that were given prominence with gestures during a storytelling session.

A number of different studies have also identified advantages in the use of gesture among L2 language learners. For instance, Andrä et al. (2020), carried out a study on the influence of gestures and pictures on L2 vocabulary learning among 8-year-old children. They found that both the gesture and the picture group outperformed the control group and that the improvement of the picture and gesture group persisted six months after the training. These results contrasted with previous experiments (Mayer et al., 2015; Repetto et al., 2017) done with adults that showed a significant difference in the benefits of gesturing over imagery. Macedonia (2014) also showed that gesturing when learning vocabulary benefited foreign language learners.

While several studies point out the benefits of using gesture to teach L2 vocabulary, there is still no evidence that gesture can also be useful to teach foreign language morphology. Thus, the present pilot study aims at testing whether the use of multimodal elements in general, and of gestures in particular, improves the training of morphological awareness among English learners of Spanish as a foreign language.

2 Method

2.1 Participants

A total of 38 participants (14 male, 24 female) took part in our pilot study. They ranged in age from 14 to 16 years ($M = 15$; SD = 0.83). All students attended the same school, an Independent School located in the West Midlands, England. The language of instruction at the school was English, and 33 of the participants were also L1 English speakers. The other 5 participants were English-Chinese or English-Turkish ballanced bilinguals. All the participants showed native-like proficiency in English. They were all learners of Spanish as a foreign language and had an A2 proficiency level in Spanish at the time of the experiment. Their regular Modern Foreign Language courses included traditional instruction based on memorization of basic syntactic structures in Spanish. None of the participants had received previous explicit instruction in morphological awareness before the beginning of this study, neither in their L1 nor in their L2. The sample population was randomly divided into 4 groups: a control group (10 participants) and 3 groups (two of 10 participants and one of 8) defined by the different sensory stimuli to which they were exposed in the training phase. All participants signed an informed consent form and agreed to participate in the experiment.

2.2 Instruments

In the present study, participants were assessed on their level of morphological awareness before and after three training sessions. The morphological awareness test (which served both as pre- and post-test) was created as an adaptation from previous existing tests: the MA test (Carlisle, 2000), the IECMO test (González-Sánchez et al., 2018), and the IECME test (García and González, 2006). As suggested by Goodwin et al. (2011), three assumptions were considered when adapting our MA measurement tools for native speakers of English: first, older learners perform better than younger learners; second, more proficient L2 learners outperform lower-proficiency learners; third, items that are less morphologically transparent or that include orthographic, phonological, or morphological modifications consistently present greater difficulties.

Our adapted test had two subtests: a derivation subtest (16 items) and a decomposition test (15 items). In the derivation subtest,

participants were given a morphologically simple word and were told to complete a sentence with a morphologically complex word derived from it. For the decomposition test, participants were given a morphologically complex word and they were told to complete a sentence with a morphologically simple word derived from it. Following Kuo and Anderson (2006), our test items included both inflectional and derivational morphology. The MA test is provided as Supplementary material.

Our final MA test had a total of 31 items, equivalent to a total of 62 points: 0 points were given for totally incorrect answers, 2 points were given for totally correct answers, and 1 point was given when the right morpheme was chosen but it was misspelled. The 31 test items included 14 words and 17 pseudowords. Following Carlisle (2000), pseudowords were used in the test in order to avoid that the limited vocabulary available to the participants could alter their decisions, that is, that they chose an answer motivated by their familiarity with a word instead of using their morphological strategies.

As for the training material, it consisted of videos which contained 16 morphologically complex words each. They were all Spanish words and no pseudowords were used at training. The types of morphemes involved in the training were similar to those in the test. There were three videos for each group (i.e., three training sessions per group) and a total of four different groups in different experimental conditions. The total of 48 trained words were identical in each group and condition. The four experimental groups at training varied according to the following different input conditions (Figure 1):

- Group A (control): words appeared at an interval of 10 s each, with no visual or acoustic cue to morpheme boundaries.
- Group B (audiovisual input): words appeared at an interval of 10 s each. Synchronized with each word, its recorded oral pronunciation was given with a short pause between the root and the morpheme.
- Group C (auditory and visual-gestural input): words appeared at an interval of 10 s each. Synchronized with each word, its recorded oral pronunciation was given with a short pause between the root and the morpheme while a hand gesture appeared on the slide marking the morphemic boundary.
- Group D (audiovisual input, with visual enhancement): words were shown at an interval of 10 s each. Synchronized with each word, its recorded oral pronunciation was given with a short pause between the root and the morpheme, while the morpheme of each word was highlighted with another color. This condition was included in order to discard the possibility that participants in group C only would outperform the rest simply because their input was visually more enhanced than the input in all the other conditions: if participants in group C outperform participants in group D, then we can be sure that it was gesture, and not simply visual enhancement, what triggered improvement in MA among participants.

2.3 Procedure

This experiment sought to evaluate the development of morphological awareness as a dependent variable from pre- to post-test after 3 training sessions in four different input conditions. The experiment was carried out over a period of 1 week, in the students' own classrooms. The tests were administered by the students' Spanish teacher, who was previously instructed on the variables and each of the steps to be followed. Participants were assigned one of the four different input conditions randomly through blind assignment.

As mentioned earlier, the experiment consisted of three phases: the pre-test, the training and the post-test. On the first day, participants took 30 min to complete the pre-test all together in their classroom.

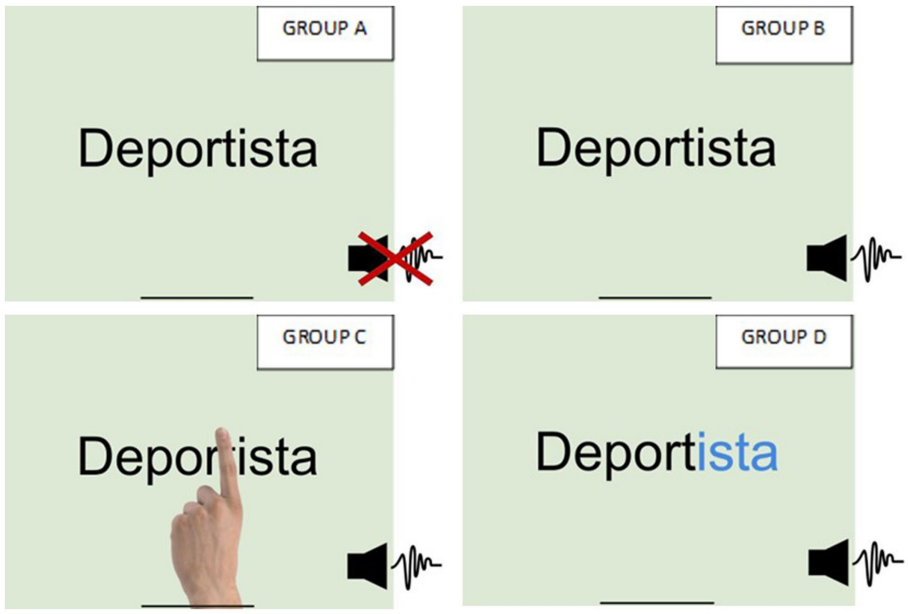

FIGURE 1
Example of training materials for the four training conditions.

Then, the training phase was spread over a week in which, on three different days, participants were exposed to one of the vocabulary videos per day. Each participant was sent a different link depending on the group to which they were assigned, and they viewed the videos in their own tablets with headphones. The input modality of each video was consistent with the group each participant was assigned to. Each video was about 3 min long. The third phase consisted on the participants' taking the post-test, which would serve to compare participants' development after the training. The procedure was the same as that carried out during the pre-test. The post-test was carried out after viewing the third training video, in the same session.

3 Results

Table 1 presents the mean scores in the two subtests of morphological awareness for each training group.

A mixed-design repeated measures ANOVA was performed to compare the effect of input modality on total morphological awareness (i.e., derivation plus decomposition) from pre- to post-test (Figure 2). There was a statistically significant effect of time (F (1, 34) = 10.27, p = 0.003, η^2 = 0.232), but not of condition (F (3, 34) = 1.246, p = 0.308, $\eta 2$ = 0.091) or the interaction between time and condition or input type (F (3, 34) = 1.19, p = 0.327, η^2 = 0.095). A more detailed analysis (Duncan *post hoc* contrast) showed that differences were found in the gesture group alone, from pre-test (M = 34.4; SD = 8.57) to post-test (M = 41.1; SD = 8.39), with a statistically significant difference (p = 0.027, d = 0.814).

We further explored whether there were differences between groups in the results of each subtest separately (i.e., derivation and decomposition). For the derivation subtest, a mixed-design repeated measures ANOVA with time (pre- and post-test) as within-subject factor and input type as between-subject factor showed no significant effect of time (F (1, 34) = 2.002, p = 0.166, η^2 = 0.056), nor of input type (F (3, 34) = 0.926, p = 0.439, $\eta 2$ = 0.079) or the interaction of time and input type (F (3, 34) = 0.907, p = 0.448, η^2 = 0.074). For the decomposition subtest, an equivalent ANOVA showed again no main effect for input type (F (3, 34) = 1.313, p = 0.286, $\eta 2$ = 0.091), although there was a significant effect of time (F (1, 34) = 13.09, p < 0.001, η^2 = 0.278) and the interaction between time and input type (F (3, 34) = 2.95, p = 0.046, η^2 = 0.207) (Figure 3).

A more detailed analysis (Duncan *post hoc* contrast) showed that differences were found between the learning gains from pre- to post-test in the gesture group (M = 4.7; SD = 3.23) in comparison with the audiovisual group (M = 0.87; SD = 3.87), with a statistically significant difference (p = 0.036, d = 1.085), as well as with the visual enhancement group (M = 0.21; SD = 3.61), also with a statistically significant difference (p = 0.009, d = 1.312).

4 Discussion

The present study aimed at exploring the influence that different input modalities and, specifically, gestural training, could have on the acquisition of morphological awareness (MA) in the learning of Spanish as a foreign language. The analysis of the data obtained provided no significant results as far as input type or condition is concerned. Thus, we cannot claim that the gesture group outperformed the other groups after the training.

A possible reason for the lack of significant differences between the gesture group and the other groups might have been the length of the treatment, since only three training sessions that lasted for 3 min each might not be enough for the benefits of gesture to emerge. Several other studies also claim that, in order for language development to occur, it is crucial that L2 learners have access to a considerable amount of input (Konishi et al., 2014; Matusevych et al., 2017). Indeed, previous studies that showed an advantage of gesture over other forms of input (i.e., Goldin-Meadow et al., 1999; Andrä et al., 2020) included longer training and larger exposure to gesture among their particiants. Thus, greater amount of exposure to multimodal gestural input might add to the efficacy of gesture as a teaching method for the foreign language classroom. While the exploratory nature of the present study could not confirm this, further research could provide stronger evidence.

Furthermore, from a psycholinguistic perspective, the limitations of the present study do not allow a deep analysis of the participants' processing of the trained items across the different experimental conditions. Thus, the present data provide little evidence as to how exactly different participants approached the trained words. It might be the case that some participants put more cognitive effort than others to work out the decomposition rules of the trained items. Previous studies on textual enhancement (e.g., Winke, 2013; Loewen and Inceoglu, 2016; Leow and Martin, 2018) have shown increased attention on the target L2 items among participants in enhanced input conditions, yet more noticing did not lead to better learning of the target items among those participants. According to Leow et al. (2019), this might be due to participants' low-level processing of the trained items. A replication of the present study using eye-tracking methodology might shed some light on the above-mentioned processing issues and the depth at which participants at different input type conditions analyse the trained items.

Despite the fact that the gesture group did not outperform the other experimental groups after training, a statistically significant main effect of time indicated improvement from pre- to post-test among the gesture group, while no such effect was found in the other conditions. Thus, the use of gesture might have a potentially beneficial effect for the development of morphological awareness in a second language, if provided more intensively. A future study with a larger

TABLE 1 Descriptive statistics of pre- and post-tests for the four training conditions.

		Derivation		Decomposition	
Condition	N	Pre-test *M* (SD)	Post-test *M* (SD)	Pre-test *M* (SD)	Post-test *M* (SD)
Control	10	22.2 (4.26)	21.2 (6.81)	9.4 (6.55)	12.4 (6.89)
Audiovisual	8	22.25 (2.71)	23.5 (4.86)	11.62 (5.85)	12.5 (4.62)
Gesture	10	22.8 (5.09)	24.8 (4.82)	11.6 (5.31)	16.3 (4.78)
Visual	10	23.6 (4.88)	26 (4.42)	14.7 (4.11)	14.9 (3.57)

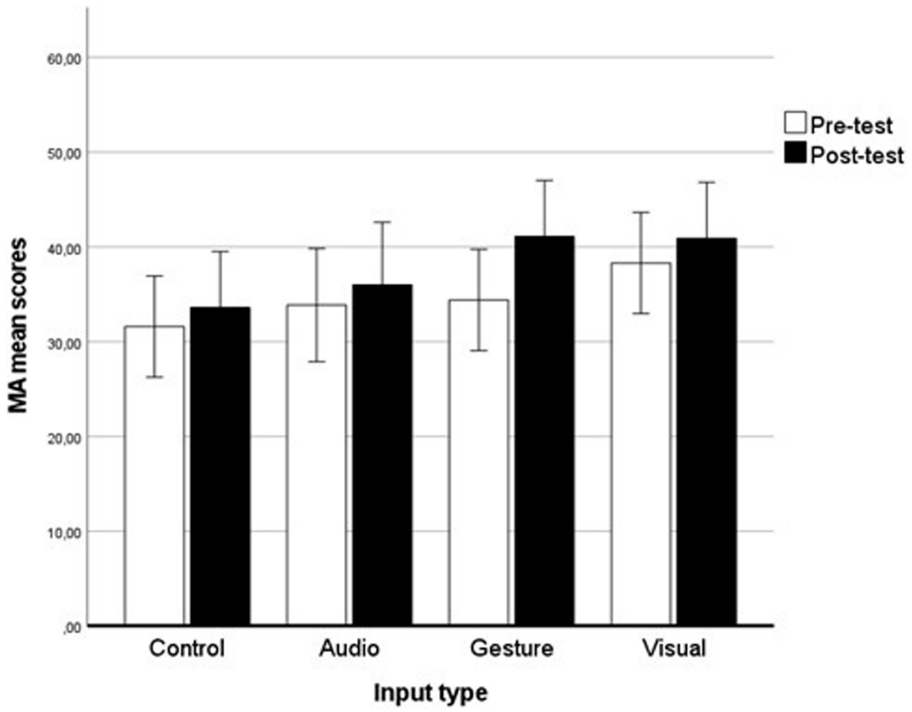

FIGURE 2
Mean total scores of MA (derivation and decomposition) across training conditions.

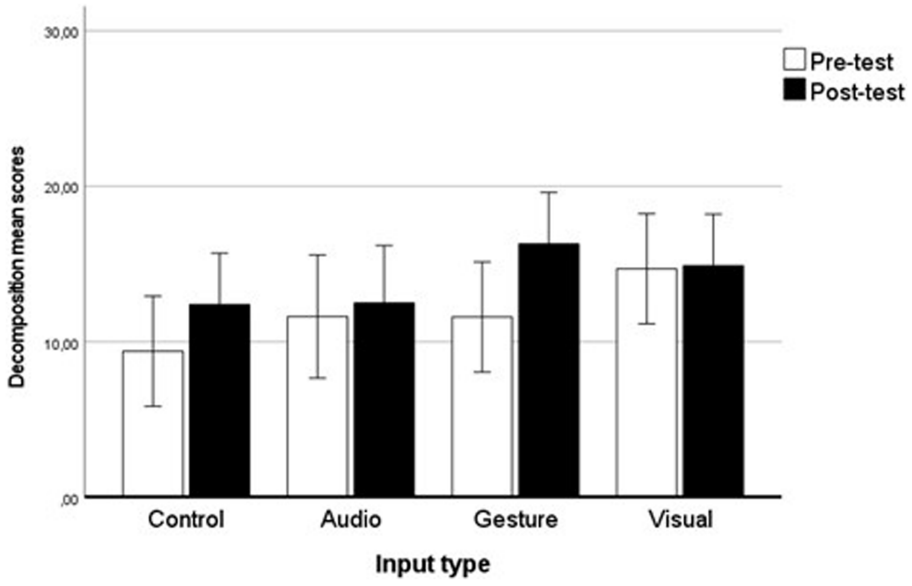

FIGURE 3
Mean scores of decomposition subtest across training conditions.

sample and a longer and more intensive training might confirm this tendency.

Further analyses on both MA subcomponents (i.e., derivation and decomposition) also found no main effect for input type, nor time or the interaction between time and input type in the case of derivation. Descriptive statistics revealed relatively high scores among the four groups of participants in the derivation pre-test already, leading to little room for improvement at post-test scores. Providing accurate measures of our dependent variable was one of the challenges of the present study, since all previous existing tests to measure morphological awareness in Spanish are meant for L1 speakers (García and González, 2006; González-Sánchez et al., 2018) and were not appropriate for L2 speakers with low proficiency level. Thus, we call for the need to create a more suitable tool to measure morphological

awareness in L2 Spanish, perhaps using items with a lower morphological transparency index or with greater orthographic modifications (Goodwin et al., 2011), which would probably eliminate the possible ceiling effects of our present adapted test. Another possible explanation for these high scores in the derivation pre-test might lie in the participants' level of MA in their L1, and the possibility of transfer from L1 to L2. Unfortunately, participants' MA in their L1 was not measured in the present study. Further research should consider MA in the L1 alongside MA in the L2 and confirm this.

Regarding the decomposition subtest, our data showed an advantage of the gesture group over the audiovisual and the visually-enhanced group in terms of decomposition. Thus, the gesture group appeared to outperform these other two groups in terms of MA gains after training. However, no such difference was found between the gesture group and the control condition. One of the possible reasons for these unexpected results might lie in the low scores that the control group obtained in the decomposition pre-test, which gave them bigger chances for improvement at post-test. While descriptive data did not reveal any potential outlier among this group, the overall pre-test mean of the group was relatively lower than that obtained by the other groups. Unfortunately, these data were collected still under post-pandemic restrictions and the researchers had no direct access to participants at the pre-test session. Even if the class teacher was given detailed information regarding the test procedure, it might have been the case that some of the participants did not understand the decomposition task at first and became better at it later. If this study were to be replicated, we would suggest providing clearer instructions to participants on the task as well as some practice items at the beginning. This should help participants become familiar with the task and it would also strengthen the validity of the test. Furthermore, as mentioned earlier, a bigger sample should allow the removal of potential outliers for a better analysis.

Further research should also explore the role of L2 proficiency level on the development of morphological awareness after training, since lower or higher proficiency learners might benefit differently from the training of this skill. Additionally, as mentioned earlier, given that morphological awareness in the L1 might not be necessarily transferred directly to the L2 (Vernice and Pagliarini, 2018), future studies should consider participants' morphological awareness in their L1 to find out whether the ability to transfer this linguistic skill to the L2 would be determined by the participants' level of proficiency in the second language, by the level of morphological awareness in their L1 (Saiegh-Haddad and Geva, 2007), or by a combination of both factors.

5 Conclusion

The present study points out towards a potential positive effect of the use of gesture as a working tool for the development of morphological awareness in a second language. With this study, new issues have arisen about the work of morphological awareness in Spanish as a foreign language in particular, and in L2 learning in general. The exploratory nature of this pilot study did not allow for a full confimation of the benefits of gesture for the training of morphological awareness. However, given the tendency of improvement shown in the data, we call for the need of further research to explore the role of gesture in morphological training. Further studies with a bigger sample and improved measurement tools should allow to confirm the impact of gesture on MA development. Furthermore, the addition of delayed post-test in the design would also provide evidence of the lasting effects of the use of gesture for language instruction.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the study involving human samples in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

SF: Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. MA: Investigation, Methodology, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcomm.2024.1370898/full#supplementary-material

References

Andrä, C., Mathias, B., Schwager, A., Macedonia, M., and von Kriegstein, K. (2020). Learning foreign language vocabulary with gestures and pictures enhances vocabulary memory for several months post-learning in eight-year-old school children. *Educ. Psychol. Rev.* 32, 815–850. doi: 10.1007/s10648-020-09527-z

Bernardis, P., and Gentilucci, M. (2006). Speech and gesture share the same communication system. *Neuropsychologia* 44, 178–190. doi: 10.1525/jlin.2004.14.2.186

Bird, S. A., and Williams, J. N. (2002). The effect of bimodal input on implicit and explicit memory: an investigation into the benefits of within-language subtitling. *Appl. Psycholinguist.* 23, 509–533. doi: 10.1017/S0142716402004022

Carlisle, J. F. (2000). Awareness of the structure and meaning of morphologically complex words: impact on reading. *Read. Writ. Interdiscip. J.* 12, 169–190. doi: 10.1023/A:1008131926604

Carlisle, J. F. (2003). Morphology matters in learning to read: a commentary. *Read. Psychol.* 24, 291–322. doi: 10.1080/02702710390227369

Carlisle, J. F., and Goodwin, A. (2013). "Morphemes matter: how morphological knowledge contributes to reading and writing" in *Handbook of language and literacy: Development and disorders*. eds. C. A. Stone, E. R. Silliman, B. J. Ehren and G. P. Wallach. *2nd* ed (New York, NY: Guilford), 265–282.

Crimon, C., Barbir, M., Hagihara, H., de Araujo, E., Nozawa, S., Shinya, Y., et al. (2022). Mask wearing in Japanese and French nursery schools: the perceived impact of masks on communication. *Front. Psychol.* 13:874264. doi: 10.3389/fpsyg.2022.874264

Drijvers, L., and Özyürek, A. (2017). Visual context enhanced: the joint contribution of iconic gestures and visible speech to degraded speech comprehension. *J. Speech Lang. Hear. Res.* 60, 212–222. doi: 10.1044/2016_JSLHRH-16-0101

Esteve-Gibert, N. (2016). "La integración de gestos y habla en el discurso" in *Panorama actual de la ciencia del lenguaje*. eds. M. C. Horno, I. Ibarretxe and J. Mendívil Primer sexenio de Zaragoza Lingüística. (Zaragoza: Universidad de Zaragoza).

Feijoo, S., Amadó, A., Sidera, F., Aguilar-Mediavilla, E., and Serrat, E. (2023). Language acquisition in a post-pandemic context: the impact of measures against COVID-19 on early language development. *Front. Psychol.* 14:1205294. doi: 10.3389/fpsyg.2023.1205294

García, J. N., and González, L. (2006). Diferencias en la conciencia morfológica, la escritura y el lenguaje en función del desarrollo y el nivel educativo del niño. *Psicothema* 18, 171–179.

Goldin-Meadow, S., Kim, S., and Singer, M. (1999). What the teacher's hands tell the student's mind about math. *J. Educ. Psychol.* 91, 720–730. doi: 10.1037/0022-0663.91.4.720

González-Sánchez, L., García, T., Areces, D., Fernández, E., Arias-Gundin, O., and Rodríguez, C. (2018). Validación del Instrumento de Evaluación de la Conciencia Morfológica Oral (IECMO). *Eur. J. Educ. Psychol.* 11, 107–122. doi: 10.30552/ejep.v11i2.225

Goodwin, A. P., Huggins, A., Carlo, M., Malabonga, V., Kenyon, D., Louguit, M., et al. (2011). Development and validation of extract the base: an English derivational morphology test for third through fifth grade monolingual students and Spanish-speaking English language learners. *Lang. Test.* 29, 265–289. doi: 10.1177/0265532211419827

Hazan, V., Sennema, A., Faulkner, A., Ortega-Llebaria, M., Iba, M., and Chung, H. (2006). The use of visual cues in the perception of non-native consonant contrasts. *J. Acoust. Soc. Am.* 119, 1740–1751. doi: 10.1121/1.2166611

Igualada, A., Esteve-Gibert, N., and Prieto, P. (2017). Beat gestures improve word recall in 3- to 5-year-old children. *J. Exp. Child Psychol.* 156, 99–112. doi: 10.1016/j.jecp.2016.11.017

Kieffer, M., and Lesaux, N. (2008). The role of derivational morphology in the reading comprehension of Spanish-speaking English language learners. *Read. Writ.* 21, 783–804. doi: 10.1007/s11145-007-9092-8

Kim, E. J. (2019). The role of morphological awareness and morphological processing in Korean secondary school students' English vocabulary knowledge and reading comprehension. *English Teach.* 74, 51–73. doi: 10.15858/engtea.74.2.201906.51

Konishi, H., Kanero, J., Freeman, M. R., Golinkoff, R. M., and Hirsh-Pasek, K. (2014). Six principles of language development: implications for second language learners. *Dev. Neuropsychol.* 39, 404–420. doi: 10.1080/87565641.2014.931961

Kuo, L. J., and Anderson, R. C. (2006). Morphological awareness and learning to read: a cross-language perspective. *Educ. Psychol.* 41, 161–180. doi: 10.1207/s15326985ep4103_3

Leow, R. P., Donate, A., and Gutierrez, H. (2019). "Textual enhancement and L2 development: a depth of processing perspective" in *The Routledge handbook of second language research in classroom learning*. ed. R. P. Leow (New York: Routledge), 317–330.

Leow, R. P., and Martin, A. (2018). "Enhancing the input to promote salience of the L2: a critical overview" in *Salience in SLA*. eds. S. M. Gass, P. Spinner and J. Behney (New York, NY: Routledge), 167–186.

Loewen, S., and Inceoglu, S. (2016). The effectiveness of visual input enhancement on the noticing and L2 development of the Spanish past tense. *Stud. Second Lang. Learn. Teach.* 6, 89–110. doi: 10.14746/ssllt.2016.6.1.5

Lyster, S. A. H., Lervåg, A. O., and Hulme, C. (2016). Preschool morphological training produces long-term improvements in reading comprehension. *Read. Writ.* 29, 1269–1288. doi: 10.1007/s11145-016-9636-x

Macedonia, M. (2014). Bringing back the body into the mind: gestures enhance word learning in foreign language. *Front. Psychol.* 5:1467. doi: 10.3389/fpsyg.2014.01467

Matusevych, Y., Alishahi, A., and Backus, A. (2017). The impact of first and second language exposure on learning second language constructions. *Biling. Lang. Congn.* 20, 128–149. doi: 10.1017/S1366728915000607

Mayer, K. M., Yildiz, I. B., Macedonia, M., and von Kriegstein, K. (2015). Visual and motor cortices differentially support the translation of foreign language words. *Curr. Biol.* 25, 530–535. doi: 10.1016/j.cub.2014.11.068

McNeill, D. (2005). *Gesture and thought*. Chicago: University of Chicago Press.

Montero-Perez, M. M. (2020). Incidental vocabulary learning through viewing video: the role of vocabulary knowledge and working memory. *Stud. Second. Lang. Acquis.* 42, 749–773. doi: 10.1017/S0272263119000706

Paivio, A. (1991). Dual coding theory: retrospect and current status. *Can. J. Psychol.* 45, 255–287. doi: 10.1037/h0084295

Pattemore, A., and Muñoz, C. (2020). Learning L2 constructions from captioned audiovisual exposure: the effect of learner-related factors. *System* 93, 102303–102313. doi: 10.1016/j.system.2020.102303

Peters, E., and Webb, S. (2018). Incidental vocabulary acquisition through viewing L2 television and factors that affect learning. *Stud. Second. Lang. Acquis.* 40, 551–577. doi: 10.1017/S0272263117000407

Repetto, C., Pedroli, E., and Macedonia, M. (2017). Enrichment effects of gestures and pictures on abstract words in a second language. *Front. Psychol.* 8:2136. doi: 10.3389/fpsyg.2017.02136

Saiegh-Haddad, E., and Geva, E. (2007). Morphological awareness, phonological awareness, and reading in English–Arabic bilingual children. *Read. Writ.* 21, 481–504. doi: 10.1007/s11145-007-9074-x

Sánchez-Gutiérrez, C. E., Marcos Miguel, N., and Robles García, P. (2020). "What derivational suffixes should we teach in Spanish as a second language courses?" in *Hispanic linguistics. Current issues and new directions*. eds. A. Morales, M. Ferreira, R. Leow and C. Sanz (Amsterdam: John Benjamins), 77–94.

Ter Schure, S., Junge, C., and Boersma, P. (2016). Discriminating non-native vowels on the basis of multimodal, auditory or visual information: effects on infants' looking patterns and discrimination. *Front. Psychol.* 7, 1–11. doi: 10.3389/fpsyg.2016.00525

Vernice, M., and Pagliarini, E. (2018). Is morphological awareness a relevant predictor of Reading fluency and comprehension? New evidence from Italian monolingual and Arabic-Italian bilingual children. *Front. Commun.* 3:11. doi: 10.3389/fcomm.2018.00011

Winke, P. (2013). The effects of input enhancement on grammar learning and comprehension: a modified replication of lee, 2007, with eye-movement data. *Stud. Second. Lang. Acquis.* 35, 323–352. doi: 10.1017/S0272263112000903