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The relationship between WhatsApp textisms and the spelling of Spanish adolescents: A case study

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Abstract: The instant messaging application WhatsApp is currently the most widely used means of communication among young Spaniards. This application, along with others of the same type, has favoured the creation of a new written code: digitalk or textese, characterised by the use of textisms, a digital norm that intentionally departs from the academic norm. The aim of this research is to explore the relationship between the textisms of Spanish teenagers on WhatsApp and the normative spelling of their academic texts. It is proposed as a novel study of particular relevance in the Spanish context. The study was carried out with 43 third- and fourth-year student of secondary education in Seville (Spain). Through a descriptive statistical analysis, the characteristics of the digital norm of adolescents on WhatsApp were sought and it was observed that the most common textism is word shortening, followed by others such as the omission of accents and the omission of punctuation marks. On the other hand, it has been observed that the use of textisms in Spanish does not harm the academic spelling of adolescents. Finally, it has been observed that there are some differences in the use of textisms between males and females, with females using a greater number of multimodal elements than males.
Keywords: critical discourse analysis; text messaging; digital communication; Spanish spelling.

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1. Introduction

1.1. Instant Messaging and Digitalk

The communicative practices of contemporary society are shaped by the widespread presence of computer-mediated communication (CMC). This communicative reality is configured through computer-mediated discourse (CMD), understood as "the communication produced when human beings interact with one another by transmitting messages via networked or mobile computers" (Herring & Androutsopoulos, 2015, p. 127). The main feature of computer-mediated discourse (CMD) is multimodality (Herring, 2019), by which CMC can support the simultaneous presence of different modes of transmission including not only text, but also voice, audio, video, and graphics. As Candefors Stæhr et al. (2019, p. 171) highlight, "people are already socialized in a communicative reality with many possibilities for interpersonal communication across online and offline contexts through different modes of interaction". In this sense, smartphone messaging is one of the most popular and extended ways of interaction within the large spectrum of possibilities offered by CMC (Yus, 2022).

According to data from IAB Spain-Elogia (2022), 92% of adolescents between 12 and 17 years of age regularly use WhatsApp as an instant messaging (IM) program. WhatsApp has thus become the most used social media in this age group, surpassing other platforms such as Instagram (83%), TikTok (77%) or Facebook (39%). This is the first fully connected generation, halfway between the so-called Generation Z and Generation Alpha, which has a complete mastery of digital interactions and for whom the use of technological devices is connatural to their personal and cognitive development, leading them to show a "fascination with electronic devices" (Castro et al., 2020).

The wide diffusion of this type of instant messaging programmes among teenagers has favoured the creation of a new written code called digitalk (Turner, 2010) or textese (Johnson, 2015), characterised by the fact that it differs from the standard writing norm. Digitalk combines elements of written discourse with features of orality in an attempt to reproduce the "voice of the speaker" (Turner, 2010, p. 43) through creativity and communicative language proficiency. In fact, it has sometimes been defined as "oralised writing" (Martín Gascueña, 2016), "oralised written text" (Yus, 2010) or "written spoken language" (Mancera Rueda & Pano Alamán, 2013).

One of the main characteristics of digitalk is the use of textisms, "contractions and non-standard spellings specifically developed to reduce the length of words for fast and cost-effective text messaging" (De Jonge & Kemp, 2012, pp. 49-50). Textisms can also include features specific to the digital medium, such as the use of multimodal elements like emoticons, emojis, images, videos, or stickers, among others (Aull, 2019; Cantamutto & Vela Delfa, 2019; König, 2019), which fulfill different pragmatic and stylistic functions in CMC (Padilla, 2023; Sampietro, 2019; Vela Delfa, 2020). The digitalk is especially sensitive to technological advances, so that "it becomes quicker and easier to type messages" without any changes in attitudes about the appropriateness or otherwise of the use of textisms (Kemp & Grace, 2017, p. 96).

Table 1. Categorisation of textisms (based on Gómez-Camacho et al., 2018)

Textisms at the graphophonemic level	
Emphatic Repetitions	
-Repetition of closing marks	— *Q nota te ha puesto en el trabajo??*'
-Repetition of one or more letters	— *en principio siii*, *Sisi graciiiassss*
-Emphatic repetition interjection or onomatopoeia	— *Bueno bueno*, *sisis*, *ouuch*
Deletions and omissions	
— Intentional word merging	— *xdio*, *Qsi he estudiado*
— Word shortening by removing letters or syllables	— *Es q no me acuerdo mu bien*
— Omission of punctuation marks	— *Q t an traio los reyes?*
— Omission of tildes	— *Estas preparada para mañana?*
— Intentional omission of H	— *Sii ya le emos dao el regalo*
— Loss of the intervocalic D	— *Y encima se a olvidao la mochila*
Non-normative graphemes	
— K-Textisms — X-textisms — S-textisms — Z-textisms — SH textisms — TX-textisms — W-textisms — Y-textisms — Non-normative use of capital letters — Textisms of numbers and symbols with their phonetic value	— *no pdo kear* — *xurra*, *muxo* — *grasia grasia* — *ez'*, *zi*, *paza* — *Ashe friooo* — *txika* — *Weno te dejo ads xD*, *wuapetona* — *iya ntr* — *Xq?*, *Xfa* — *NECESITO q pongan ya las listas*
Lexical-semantic textisms	
— Dialectalisms — Transcription of diatopic, diastratic and diaphasic varieties — Creation of new words, non-normative onomatopoeias or interjections, amalgams, or conglomerates	— *Miarma* — *Oma quiero tortilla* — *awwww* — *lol*, *ese gym esta wuapo o q?* — *ntr* (no te ralles), *oka*
— Foreign words — Non-normative acronyms, abbreviations, and acronyms	
Multimodal elements	
Emoticons, images, audios, videos, stickers	

In relation to the Spanish language, digitalk has been described in detail over the last decade. Numerous studies detail the characteristics of digitalk, both with respect to European Spanish (Calero, 2014; Caurcel Díaz et al. 2013; Ibarra Murillo, 2019; Mancera Rueda, 2016; Mancera Rueda & Pano Alamán, 2013; Mas Álvarez & Zas Varela, 2012; Vázquez-Cano et al, 2015) as well as its use in some of the varieties of American Spanish (Cantamutto, 2018, 2019; Cantamutto & Vela Delfa, 2018; Flores-Salgado & Castineira-Benítez, 2018; Giraldo Giraldo et al., 2018). According to Mancera Rueda (2016), digitalk is characterised by the

presence of elements that can be classified into two main categories: antiorthography (Palazzo, 2005) and heterography (Martínez de Sousa, 2004) or dysorthography (Gómez-Camacho, 2007). The first group includes unintentional deviations from the orthographic norm, i.e. spelling mistakes (errors in accentuation or in the use of letters) caused by ignorance or insufficient knowledge of the linguistic norm on the part of the speaker. For their part, heterographies or disorthographies are phenomena specific to digitalk, insofar as they are intentional and conscious deviations from the orthographic norm with an expressive function in the digital communicative context.

Gómez-Camacho et al. (2018, p. 94) offer a categorization of textisms in Spanish. This classification can be organized into three levels: graphophonemic, lexical-semantic, and multimodal textisms, although these textisms can appear simultaneously in a single element (Table 1). The graphophonemic level includes those textisms based on the discrepancy between phoneme and grapheme, such as the phenomena of word shortening or reduction, the use of non-normative graphemes, or the repetition and omission of graphemes, punctuation marks, or capital letters. Textisms at the lexical-semantic level include the use of dialectalisms, the creation of new words, and the use of foreign words. Finally, the multimodal level contains the use of emoticons, images, videos, audios, or stickers. Table 1 shows the reformulation of Gómez-Camacho et al. (2018) types of textisms with examples extracted from the corpus analized.

1.2. Literature review

The spread of digitalk has generated extensive debate about its interaction with the standard writing norm and its possible negative influence on the literacy of children, adolescents, and adults (Zebroff, 2018). Research shows that the influence of digitalk and textisms on literacy can be associated with certain factors and does not affect all language skills equally. Bernicot et al. (2014) argue that factors that may influence the way in which digitalk interacts with grammatical competence are: the type of spelling (normative or usage), the level of written competence (skilled vs. less-skilled), the duration of practice with digitalk, or the type of textisms used. This would justify the very disparate and contrasting results observed in the literature.

In addition, the age and gender of users also determine the way in which digitalk is used; in this regard, several studies show that younger users use more textisms than older users (Hilte et al., 2017; Verheijen, 2018) and that women incorporate more textisms and multimodal elements in their digital communications (Grace & Kemp, 2015; Rosen et al., 2010; Tossell et al., 2012).

On the one hand, numerous studies show a negative correlation between the use of textisms and certain aspects of communicative competence, such as morphological awareness (De Jonge & Kemp, 2012), reading accuracy (Drouin, 2011; Drouin & Driver, 2014) or vocabulary (Drouin & Driver, 2014).

Other research, however, has clearly shown a limited or even positive influence between the use of textisms and literacy skills in different languages, highlighting that "the use of grammatical violations does not appear to be linked to changes in grammatical skills over time" (Wood et al., 2014, p. 427); these studies consider that digitalk is not a threat in the language skills of children, adolescents, or adults. Van Dijk et al. (2016) observe that word omission in digital writing is closely linked to grammar performance in Dutch, in that "the more words children omitted in their text messages, the better their grammar performance" (Van Dijk et al., 2016, p. 16). Similarly, a positive correlation has been observed between the use of instant messaging applications and higher spelling performance in Dutch (Verheijen et al., 2020; Verheijen & Spooren, 2021) and English (Plester et al., 2009; Wood et al., 2011). Lanchantin et al. (2015, p. 21) highlight, in their study with French speakers, that "adolescents rely on their literacy knowledge to notice what could be deleted or replaced in a DWIM [Digital Writing in Instant Messaging] production", confirming that the participants in their research showed a high morphemic awareness that induced them to delete morphemes without phonetic value in their digitalk and to keep them in their traditional writing.

Finally, in terms of the relationship between textisms and spelling competence, Bernicot et al. (2014) showed how the type of textism used became a determining factor. Thus, textisms and traditional spelling could be negatively, neutrally, or positively correlated, depending on whether the textism broke or coincided with the relationship between graphemes and phonemes established by the standard writing norm. Based on these studies, we can conclude that IM app users are aware that digitalk and standard writing are two different codes, "whose acquisition is dependent on the same symbolic abilities" (Bernicot et al., 2014, p. 570), but which allow "a willing playful engagement with language" (Plester et al., 2011).

In the context of the Spanish language, research has focused on the analysis of students' or preservice teachers' perception of the influence of instant messaging on their own or adolescents' spelling competence. Although the results show, in general, a negative perception of digitalk over standard writing (Cremades et al., 2021; Giraldo Giraldo et al., 2018), some studies reveal a greater tolerance among young IM users toward three types of textisms that do not contradict the academic norm, i.e., textisms based on multimodal elements (Gómez-Camacho et al., 2018), those that do not alter the relationship between phonemes and graphemes (Hunt-Gómez et al., 2020) and those based on the creation of neologisms (Núñez-Román et al., 2021).

Despite a conspicuous amount of research in other languages, in the context of the Spanish language, research comparing real texts from the secondary school classroom and interventions taken directly from the WhatsApp chats of 14-16 years-old is scarce. Therefore, the aim of this research is to describe the characteristics of the digital norm of Spanish adolescents in their interactions through WhatsApp and to explore the relationship between the use of textisms and the normative orthography of their academic texts. It will also analyze the existence of possible differences in relation to the user's gender. Thus, it is a novel study of particular relevance in the field of Spanish. To this end, a secondary school involved in educational

research projects at the university, national, and European Union level was selected for the case study. It is also involved in educational action research projects in which secondary school teachers participate, and in educational innovation projects to incorporate ICT into language teaching. The research questions to be addressed are as follows:

RQ1. What are the characteristics of the digital norm used by adolescents on WhatsApp?

RQ2. What is the relationship between textisms in WhatsApp chats and misspellings in adolescents?

RQ3. Are there gender differences in the digital norm used in WhatsApp and its relation to academic spelling?

2. Method

The case study is selected as the method to develop this research, as it allows the knowledge of the particular or idiosyncratic, as opposed to the general. This method aims to detect what is characteristic and noteworthy that must be learned from a specific and simple case (Stake, 1995). The selection of a specific case would allow the connection of the same, documenting the specificity, allowing to go further (Walker, 1983), which would give rise to the generation of substantive theories, discriminating between the common and the particular of the case under study.

2.1. Context description

In this study, the Secondary School IES Jesús del Gran Poder located in Dos Hermanas (Seville, Spain) was selected on the basis of the following criteria:

- This secondary school was used as a pilot centre in the research project "The digital writing of adolescents in Andalusia and its educational implications" (US-1380916) of the University of Seville, co-funded by the European Union ERDF Operational Programme 2014-2020 and by the Department of Economic Transformation, Industry, Knowledge and Universities of the Andalusian Regional Government (Spain). The data from this centre were the first to be collected in the project and were used to validate the data collection instrument.
- At the same time, the school is coordinating an educational research project funded by the call for Research Projects, Innovation, and Curricular Materials of the Department of Education of the Andalusian Regional Government entitled "The digital writing of Secondary Education students in Andalusia. Educational implications of instant messaging" (41701857).
- The school participates in a Digital Transformation in Education Project of the regional Department of Education, one of whose objectives is to incorporate ICT in the teaching of languages in secondary education.
- It is a small secondary school in a metropolitan area, close to the capital city, with a medium socioeconomic level. It therefore has no characteristics in terms of the varieties of the Spanish language or socioeducational level that would affect the results of the study.

2.2. Participants

The sample of participants, which makes up the case study, consists of 43 students, of which 75% are female and 25% are male. Participants are enrolled at IES Jesús del Gran Poder in Dos Hermanas (Seville, Spain). Specifically, 70% of the sample is in the third year of compulsory secondary education and 30% is in the fourth year of compulsory secondary education, levels attended by students aged 14 to 16.

2.3. Instrument and data collection

The data were collected through real texts provided by the students participating in the study collected, on the one hand, from instant messaging applications on their smartphones (in this case WhatsApp) and, on the other hand, from academic texts produced as an activity in the secondary school classroom.

A research team composed of 30 active language teachers of secondary education belonging to the project "Digital writing of secondary education students in Andalusia. Educational implications of instant messaging" collected the texts as a classroom activity and as part of the syllabuses of secondary education language subjects[1]. The participating students selected an uncorrected handwritten text that they considered representative of their way of writing in class (notes, essays, etc.). At the same time, the participating students selected WhatsApp messages, also uncorrected and unmodified, which they considered representative of their way of writing through this application, and which had been sent in the context of digital communication with other adolescents, previously eliminating any personal reference or confidential data.

The interventions in WhatsApp of the 43 participants in the study were analyzed, considering as intervention the text written by the subject preceding the click on the Send button in the App. An average message-intervention in the social network of 20.14 (SD=2.406) was obtained. The message rate ranged from a minimum of 13 interventions to a maximum of 33. In total, 866 interventions were collected.

[1] Data collection had the authorisation of the School Council and the Educational Administration and complied with the ethical standards for educational research of the Regional Ministry of Education of Andalusia and the University of Seville.

2.4. Data coding

Every WhatsApp single intervention was coded by two evaluators from the project "Digital writing of adolescent students in Andalusia. Instant messaging and its educational implications", according to the textisms established by Gómez-Camacho et al. (2018) (Table 1) for the Spanish language in a previous study of this research. These categories were validated by six researchers who independently coded the collected material, unified the criteria, and made decisions related to divergent elements, thus establishing the final categories for the analysis (Table 2). The results obtained were pooled, discrepancies were resolved according to the unified criteria established by the six researchers, and a single final coding was carried out.

Table 2. Categories of analysis of textisms

Code	Variables
v1_text	Repetition of closing marks?! (i.e., *kiya!!!!!)*
v2_text	Repetition of one or more letters (i.e., *QUEEE?)*
v3_text	Emphatic repetition interjection or onomatopoeia (i.e., *jajajaja*)
v4_text	Intentional word merging (i.e., *Holaquehaces*)
v5_text	Non-normative use of capital letters (i.e., *te NECESITO ana*)
v6_text	Word shortening by removing letters or syllables (i.e., *ta bn*)
v7_text	Omission of punctuation marks (i.e., *Ke pasa? no te visto*)
v8_text	Omission of tildes (i.e., *ke paso*)
v9_text	Loss of the intervocalic D (i.e., *comío*)
v10_text	K-Textisms (i.e., *te kiero*)
v11_text	X-textisms (i.e., *ola a todxs*)
v12_text	S-textisms (i.e., *ké ases*)
v13_text	Z-textisms (i.e., *ca pazaoooo*)
v14_text	SH-textisms (i.e., *shica*)
v15_text	TX-textisms (i.e., *txica*)
v16_text	W-textisms (i.e., *weno*)
v17_text	Y-textisms (i.e., *kiya*)
v18_text	Intentional omission of H (i.e., *ke a pasao*)
v19_text	Textisms of numbers and symbols with their phonetic value (i.e., *cansa2, no vngo +)*
v20_text	Words in English, other languages or invented words (i.e., *srry brother*)
v21_text	Multimodal elements: emojis, stickers, etc. (i.e., 👏👏👏👏)

The academic texts were coded according to the orthographic categories established by the Royal Academy of the Spanish language in the Orthography of the Spanish Language (Real Academia Española, 2010, pp. 72-160) (Table 3).

Table 3. Categories of orthographic analysis (RAE, 2010)

Código	Variables
v1_ort	Diacritical errors (i.e., *exámen, volveis, agüa*)
v2_ort	Omission of the letter h— (i.e., *a venido*)
v3_ort	Errors in phoneme /b/ (i.e., *iva, ba*)
v4_ort	Errors in phoneme /g/ (i.e., *agüa, ágila*)
v5_ort	Errors in phoneme /j/ (i.e. conduge, girafa)
v6_ort	Errors in phoneme /ll/ (i.e.,*yamame*)
v7_ort	Errors in phoneme /z/ (i.e., *consecuensia, sepillo*)
v8_ort	Errors in phoneme /s/ (i.e., *concecuencia, estraño*)
v9_ort	Errors in phoneme /k/ (i.e., *quanto*)
v10_ort	Errors in phoneme /rr/ (i.e.,*Enrrique*)

To process the data, two record sheets are created in GoogleForm, one for the analysis of textisms that appear in student messages posted on the WhatsApp social network and the other for the analysis of spelling errors that appear in academic texts.

All variables are scale variables. In addition, a total variable is generated in each of the cases that corresponds to the total number of spelling errors made in academic texts and the total number of textisms in WhatsApp messages.

2.5. Data analysis

The textisms and misspellings of each participating student were analysed by two evaluators from the project "Digital writing of adolescent students in Andalusia. Instant messaging and its educational implications", according to the categories described in Tables 2 and 3.

To answer the first and second research question, statistical analyses were performed for the descriptive results of central tendency (mean) and dispersion (standard deviation, hereafter SD; and minimum and maximum). Bivariate correlation analyses were also carried out by applying Pearson's coefficient to check the degree of relationship between the scale-type variables analysed.

Subsequently, the textism density parameter coined by Drouin (2011) and De Jonge and Kemp (2012) was calculated by dividing the total number of textisms by the total number of words in the sample texts (Kemp et al., 2021). Every textism appearing in each intervention was quantified, except for textisms from the category Emphatic Repetitions (Table 1), which were computed as a single occurrence in each intervention. The same procedure was used to calculate the density of spelling errors in academic texts.

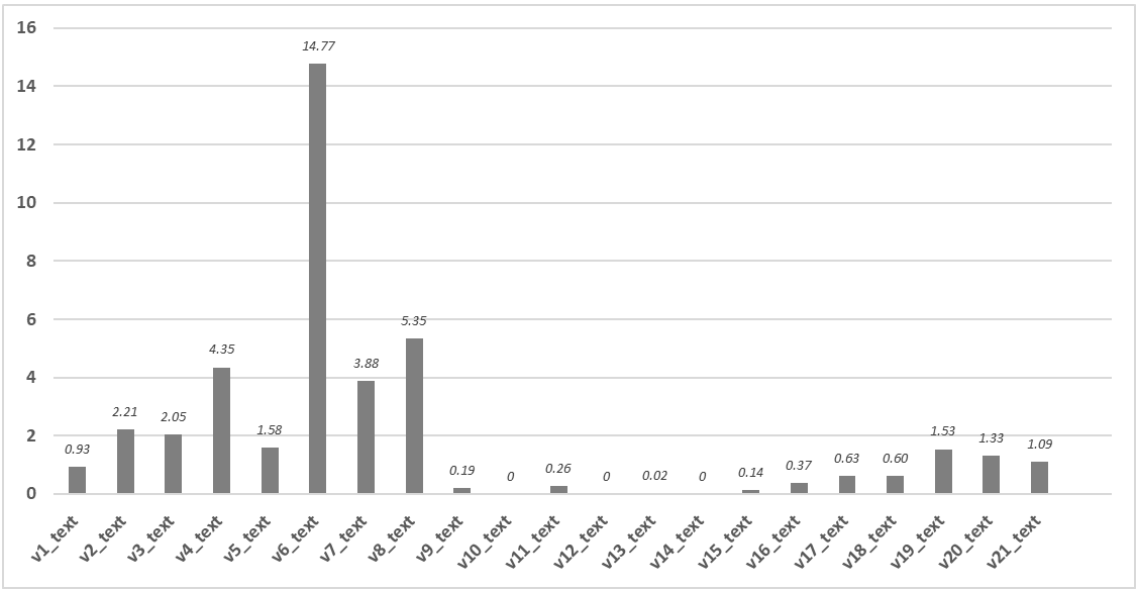
To answer the third research question, inferential analyses were also carried out according to gender. The KS and Shapiro Wilk test determined the normality of the dependent variables, Student's t-test (previous Levene's test to determine equality of variance) was applied for parametric variables and the Mann Whitney U-test for nonparametric variables. IBM SPSS v.26 software was used for statistical analysis and GPower software was used to calculate the effect size.

3. Results

To answer the first research question, a descriptive statistical analysis of the textisms appearing in the sample was carried out. The text messages analysed had an average of 103 words (SD=37.07), ranging from 35 to 184 words; specifically, an average of 41 textisms (SD= 16.98) appeared per text message written on WhatsApp, ranging from a minimum of 13 to a maximum of 81. The density of textisms reached a value of 0.43.

Word shortening (v6_text) is the most frequently occurring textism (Examples 1-3), reaching an average value of 14.77 (SD= 12.40). It is followed, although with some distance, by the omission of tildes (v8_text; Examples 4-5) and punctuation marks (v7_text; Examples 6-7), with average values of 5.35 (SD= 3.16) and 3.88 (SD= 2.42), respectively (Figure 1).

Figure 1. Descriptive statistics: textisms



(1) *Yo tengo q darlo tmb* [Yo tengo que darlo también = I have to give it too]
(2) *nse la q a ti mas t guste* [No sé, la que a ti más te guste = I don't know. The one you like the most]
(3) *no pdo kear* [No puedo quedar = I can't hang out]
(4) *cuando este llegando* [Cuando esté llegando = When I am/she/he is arriving]
(5) Abreme, no? [Ábreme, ¿no? = Open up, won't you?]
(6) Qué vamos a hacer hoy?? [¿Qué vamos a hacer hoy? = What are we going to do today?]
(7) hoy ala b3!!!!!! [¡Hoy a la B3! = Today in classroom B3!]

With mean occurrence values slightly above 2, we find textisms by repetition of one or more letters (v2_text, x=2.21, SD=2.45; Examples 8-9) and emphatic repetition of interjections or onomatopoeias (v3_text, x=2.05, SD=2.05, Examples 10-11).

(8) *Sisi graciiiassss* [Sí, sí, gracias = Yes, yes, thank you]
(9) *Hoy saleees?* [¿Hoy sales? = Do you go out today?]
(10) *Jajajajaja vale pues avísame* [ja, ja, ja, vale, pues avísame = ha, ha, ha, ha, okay, so let me know]

(11) *Ayyyyy q quiereeee* [¡Ay! ¿Qué quieres? = Ouch! What do you want?]

With low average frequency values, between 1 and 2, there are low frequency values for textisms affecting the non-normative use of capital letters (v5_text, x=1.58, SD=1.89; Example 12), multimodal elements (v21_text, x=1.53, SD=3.78; Example 13-14), lexical-semantic textisms (v20_text, x=1.33, SD=2.16; Example 15-16) and the intentional loss of the intervocalic <-d-> (v9_text, x=1.09, SD=1.96; Example 17-18). The remaining textisms appear with average scores below 1 in frequency of occurrence and are therefore irrelevant for this study.

(12) *Lit la serie es IGUAL* [Literalmente, la serie es igual = Literally, the TV show is the same]

(13) *Va* 👌 [Va bien = It's ok]

(14) *una fiestuki:*D [Una fiestuqui = A party]

(15) *Estoy anca mi abuela* [Estoy en casa de mi abuela = I am at my grandmother's house]

(16) *Anyways era eso thanks* [De todas formas, era eso, gracias = Anyway, that was it, thank you]

(17) *Todavia ni nos hemos comio la tarta* [Todavía ni nos hemos comido la tarta = We haven't even eaten the cake yet]

(18) *xq q pesaito cn la bici qillo* [Porque qué pesadito con la bici, chiquillo = Because you're such a pain in the ass with the bike, kiddo]

The analysis of the correlations between the different textisms using Pearson's coefficient offers some significant results to answer the first research question (Table 4). Firstly, there is a significant and inversely proportional correlation between the total number of words on WhatsApp and the density of textisms (-.536), suggesting that in shorter texts, with more interventions, the writing norm is further away from academic spelling. On the contrary, longer interventions that develop more complex syntactic structures tend to reproduce standard Spanish writing.

Table 4. Correlation between textisms

	v5_ text	v6_ text	v7_text	v10_ text	v17_text	v18_ text	v19_ text	v20_ text	Number of WhatsApp Words	Number of textisms
v3_text						**-.323***				
v4_text		**.673****			**.413****					**.782****
v5_text						**-.313***	**-.327***			
v6_text							**.403****			**.865****
v9_text		**.419****							**.320***	**.478****
v17_text		**.354***	**-.308***				**.685****			**.368***
v21_text				**.671****				**.367***		
Number of WhatsApp Words	**.337***		**.304***							
Textism density		**.496****		**.421****	**.492****		**.438****		**-.536****	

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

Secondly, the results show the relationship between the textisms that are associated with the dialectal pronunciation of the participants in the study. For example, in the loss of intervocalic <-d-> (v9_text), the use of <y> to reproduce the Andalusian adolescents' pronunciation of *yeismo* (v17_text), and word merging and word shortening (v4_text, v6_text). Moreover, the significant correlation of these textisms with the density of textisms of each speaker confirms that there is a very interesting relationship between the varieties of spoken Spanish and the digital norm of WhatsApp messages in the sample of this study.

The lexical-semantic level textisms such as the use of English words (v20_text) and the multimodal level textisms (v21_text) establish a moderate correlation, suggesting that other communication codes that adolescents use to communicate in addition to Spanish also influence the way they write on WhatsApp. In the same sense, the correlation between numbers and symbols with their phonetic value (v19_text) with word shortening (v6_text) also points to the idea that non-verbal languages influence the digital norm of the sample analysed.

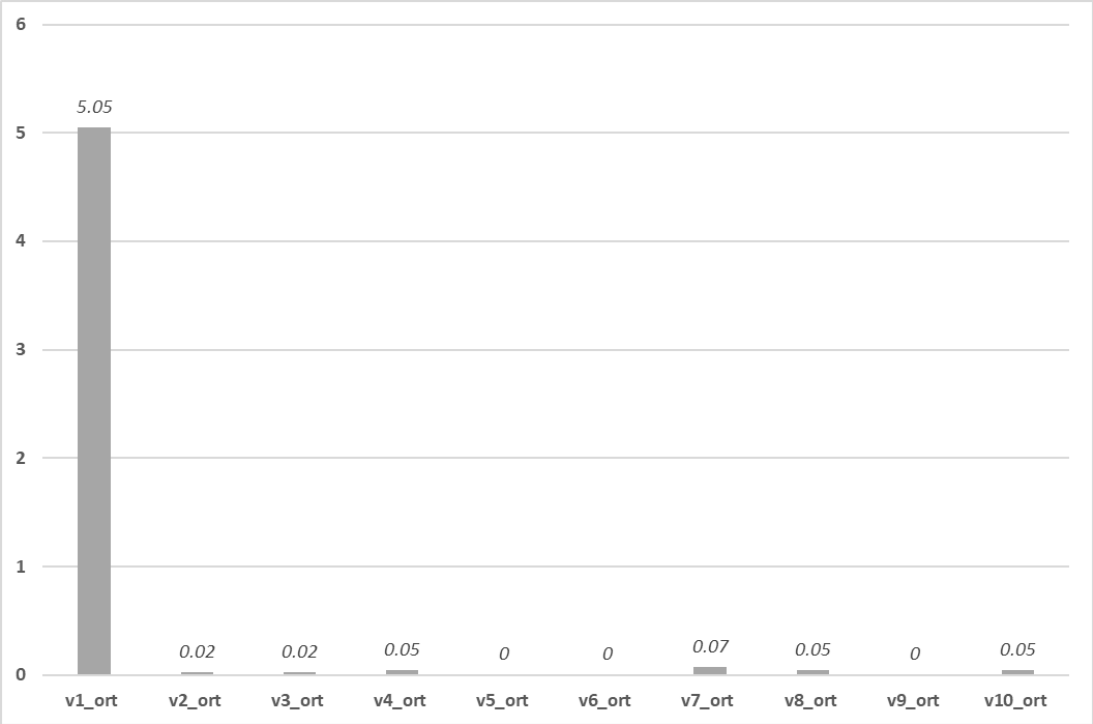
Finally, the correlation between the intentional word merging (v4_text), word shortening (v6_text) and textisms of numbers and symbols with their phonetic value (v19_text), the first two cases being a positive correlation with moderate intensity and the third moderate-high (r=,685), accurately describes the mechanisms preferred by the participants in the sample when shortening messages by omitting graphemes and conventions of standard Spanish writing.

In order to answer the second research question, the spelling of the academic texts in the sample was analysed, with an average of 214 words, ranging from 38 to 456 words. An average of 5 spelling errors (SD= 5.99) are made per academic text, ranging from a minimum of academic writings containing no errors at all

to others with a maximum of 30. The whole sample analysed has a spelling error density of 0.03 compared with a textisms density of 0.43 in the same speakers.

As can be seen in Figure 2, the only spelling mistake that is significantly repeated in the academic texts analysed is the omission of tildes (v1_ort; Examples 19-21) with a specific mean value of 5.05 (SD=6.95). The rest of the spelling mistakes are occasional and of no interest for this study.

Figure 2. Descriptive statistics: Spelling errors



(19) *La <u>pelicula</u> que vi ayer me <u>encanto</u>* [I loved the movie I saw yesterday]

(20) *¿<u>Que</u> hay en el pozo? En <u>el</u> hay agua* [What is in the water well? There is water in it.]

(21) *<u>Creian</u> que la <u>mision</u> de los gobernante era el bienestar de sus súbditos* [They believed that the mission of leaders was the wellbeing of their subjects.]

Bivariate correlation analysis using Pearson's coefficient showed no relationship between misspelling density and textisms density. Although we detected a very low and non-significant descriptive tendency (r= –0.211; p = 0.174) for the total number of textisms to be inversely related to the total number of misspellings, our results do not allow us to relate textisms and misspellings in general.

However, two textisms present a distinct relationship with misspellings that deserves special attention. First, we found a significant correlation (p= 0.003 ≤ 0.05) with moderate strength (r= 0.447) between the intentional omission of tildes (v8_text) in WhatsApp messages and the omission of tildes as a misspelling of academic texts collected in diacritical errors (v1_ort). This induces an increase in the number of missing tildes when writing on WhatsApp in those subjects who make spelling errors of a diacritical nature, especially the absence or improper use of tildes.

In the same sense, although there is no direct relationship between the use of textisms and the density of spelling mistakes, we found a significant correlation (p= 0.009 ≤ 0.05) with moderate-low strength (r= 0.391) between the intentional omission of <h> (v18_text) and the density of spelling mistakes in their academic texts. However, we found no relationship between the omission of <h> in WhatsApp and in academic texts.

To answer the third research question, we performed the parametric inferential Student's t-test (prior Levene's test assuming equality of variance, since p-value >,05). This test is applied to all the variables of textisms that turn out to be parametric; only the variable v21_text does not fit the normal. Through this test, no significant differences were found in any of the proposed textisms according to the gender variable.

However, the descriptive data obtained separated by gender shows a higher prevalence in the use of multimodal elements (v21_text) and English words (v20_text) in women. Specifically, none of the male participants used multimodal elements more than once in their WhatsApp messages (Example 22), compared to 34.4% of women who inserted two or more multimodal elements in their texts (Examples 23-24).

(22) nomesirve😡 [No me sirve = It does not work for me]

(23) mañana x la tarde😎😎😎 [Tomorrow afternoon]

(24) qe cute👉👈 [How cute!]

This is confirmed by the Mann Whitney U test for non-parametric variables (U= 109.000, Z=-2.087 and p-value =,037). The effect size with Cohen's D is 0.59. Looking at the mean ranks, males with 15.91 and females with 24.09 make less use of multimodal items.

4. Discussion

With respect to the first research question, the most frequently used textisms are the word shortening, the intentional word merging, the omission of tildes and the omission of punctuation marks. The emphatic repetition of interjections or onomatopoeias and the repetition of one or more letters are also very relevant. These data coincide with those obtained by Vázquez-Cano et al. (2015) and Yus (2022) for Spanish, which also show a high specificity of these textisms, and by Plester et al. (2009) for English. The digital norm used by the participants in the study is consequently characterised by the coexistence of textisms that shorten writing together with emphatic repetitions reflecting emotions and feelings. It is therefore not a norm aimed at language economy but a new way of writing that serves a particular communicative purpose (De Jonge & Kemp, 2012; Van Dijk et al. 2016).

Another distinctive feature of the digital norm used by the participants in the study was the use of textisms that reproduce features of Andalusian speech. The loss of intervocalic <-d->, the shortening and apocopes at the end of the words or the orthographic *yeismo* that replaces the digraph <ll> show the intentional representation of the distinctive features of the local speech of the participants in the sample in the written norm of their WhatsApp messages. This is a feature that confirms the close relationship between digitalk and orality, a factor that allows for a greater presence of diatopic varieties of the language in IM in contrast to other written varieties that are more conditioned by the standard writing norm (Martín Gascueña, 2016).

Finally, the relevance in the digital norm of the adolescents participating in the study of the use of numbers and symbols with their phonetic value, the textisms of the lexical-semantic level and the textisms of the multimodal level confirm the influence of the non-verbal languages used by adolescents in this type of writing. These data are consistent with those obtained by Vázquez-Cano et al. (2015).

The second research question investigated the relationship between textisms and misspellings. The participants in the study multiply by fifteen the density of textisms with respect to the density of misspellings in their texts. The density of textisms in our study is similar to that obtained by Bernicot et al. (2014) and higher than that collected by Plester et al. (2011). These data confirm that the discrepancies with the academic spelling norm in WhatsApp were intentional and in no way can they be considered spelling mistakes.

Academic texts are characterised by correct spelling for the final years of compulsory education in Spain, except for mistakes in the use of the tilde accent, in contrast to the systematic use of textisms in messages sent with smartphones. The academic texts produced by the participants in this study present few spelling mistakes which are repeated many times, so that the vast majority of spelling mistakes categorised in our data collection instrument (where all possible theoretical spelling mistakes in Spanish are collected) do not appear. These findings indicate that there is no evidence of a direct relationship between the use of textisms and a higher occurrence of misspellings in the sample analyzed. These results are in line with other studies carried out in other languages, which confirm that there is no negative relationship between the use of textisms and adolescent literacy (Plester et al., 2009; Verheijen & Spooren, 2021; Verheijen et al., 2020; Wood et al., 2014). Conversely, some data suggest that those who use more textisms make fewer spelling errors, although this is not a finding of our research.

As expected, the use of the tilde is the recurrent problem among proficient speakers of Spanish who complete compulsory education, while misspellings of letters and digraphs are certainly rare. In parallel, textisms that alter the traditional relationship between phonemes and graphemes in Spanish orthography are the least used in digital communication, in line with the results obtained by Bernicot et al. (2014) for the French language, while the intentional omission of tildes is one of the most frequent textisms.

In this context, we found a moderate correlation between the absence of tildes in WhatsApp texts and in academic texts. This result can be interpreted in two ways; either some tildes are omitted in digital communication out of ignorance and should be considered misspellings and not textisms, or this particular textism is related to misspellings. This conclusion is consistent with that obtained by Bernicot et al. (2014) in their study for the French language, in the sense that some rule-based textisms can be related to misspellings. However, a limitation of our study would be the impossibility to distinguish in WhatsApp messages in which cases the omission of tildes was intentional (textisms) and in which cases this omission was due to inattention or ignorance (misspellings). Future research should delve deeper into the omission of tildes in the digital context and its relationship with misspellings of the same type in academic texts, beyond this case study.

With regard to the third research question on the influence of gender on the use of the digital norm, it can be seen that female students participating in the study used more multimodal elements on WhatsApp. These results are consistent with those obtained by Grace and Kemp (2015), Kemp and Grace (2017), Rosen et al. (2010) and Tossell et al. (2012) in the context of SMS. In any case, as pointed out in the results of the study by Adams et al. (2018), the differences are not statistically significant at the general level, so gender cannot be considered a predictor of textisms use in the adolescents in our study sample.

5. Conclusions

The purpose of this study was to analyse the use of the digital norm in the WhatsApp chats of Spanish adolescents in the third and fourth years of Compulsory Secondary Education and its relationship with the standard orthography of Spanish, as well as investigate the possible differences depending on the user's gender.

The results of this case study show a typical adolescent competent in both academic and digital norms, who shortens words (often as a transcription of their dialectal speech) and incorporates emphatic repetitions, signs, symbols, and multimodal elements into their texts that are foreign to the traditional relationship between phonemes

and graphemes in the Spanish language. These free and creative speakers communicate very effectively in the new digital genres, showing that the digitalk of the adolescents participating in this study therefore possesses the fluency and conversational features of Smartphone Messaging described in Yus (2022).

In addition, the use of textisms in Spanish does not impair adolescents' academic spelling. Spanish adolescents know and use with more or less success the standard orthographic norm in their academic texts according to their educational level. Regarding the mistakes associated with the use of the tilde accent, further research should determine whether these are intentional omissions specific to the digital standard or anti-orthography examples.

Finally, there is no significant difference in the use of textisms according to the gender of the participants, apart from a more frequent use of multimodal textisms among women.

In conclusion, adolescents integrate different varieties of the Spanish language, different languages, and even non-verbal codes in their digital communication on WhatsApp, which allow them to communicate very effectively in the digital context without undermining their orthographic competence in standard Spanish.

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CREDiT Authorship Contribution

A.G.C., F.N.R., J.C.J. and M.P.O. contributed to the design and implementation of the research, the analysis of the results and the writing of the manuscript.

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