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2 B kreativ' or not to be creative: textisms and texters' creativity

Etre kreatif' ou ne pas être créatif : les textismes et la créativité des texteurs

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Abstract

Introduction – Text messages are particularly popular among young people. Studies have focused on the links between writers' unconventional spelling and literacy skills. Creativity gives the possibility to cope with the numerous changes people have to face.

Objective – The present research aimed to examine the relation between the creative potential of texters (text-message writers) and their use of textisms (a change in a word's orthographic form as compared to traditional writing).

Method – Two corpora were compiled: one of 285 elicited text messages and one of 580 naturalistic text messages produced in daily-life situations by undergraduates (n = 29, 20–23 years of age). Two types of textisms were measured: those consistent with traditional written code and those breaking with traditional written code. Four scores of creative potential were considered: graphic divergent thinking, verbal divergent thinking, graphic integrative thinking and verbal integrative thinking.

Results – The results showed negative correlations between the level of creativity and the density of textisms. Overall, texters who were creative in divergent thinking produced fewer textisms breaking with traditional written code.

Conclusion – The results of our study are discussed with regard to the texters' flexibility and ability to adapt or appropriately address their interlocutor.

Keywords: text messaging, textisms, creativity

Résumé

Introduction – Les SMS sont particulièrement populaires auprès des jeunes. Les études se sont notamment focalisées sur le lien entre l'orthographe non conventionnelle des texteurs et leurs compétences alphabétiques. L'étude de la créativité donne l'opportunité de s'intéresser à de nouvelles variables en lien avec l'écriture numérique.

Objectif – Cette recherche a pour objectif d'étudier la relation entre le potentiel créatif des texteurs (scripteurs de SMS) et leur utilisation de textismes (changement dans la forme orthographique d'un mot par rapport à l'écrit traditionnel) lors de la rédaction de SMS.

Méthode – Deux corpus ont été constitués : l'un de 285 SMS provoqués artificiellement sous scénarii et l'autre de 580 SMS naturels réellement produits dans la vie quotidienne par des étudiants de premier cycle (n = 29, 20-23 ans). Deux types de textismes ont été mesurés : ceux correspondant au code écrit traditionnel et ceux en rupture avec le code écrit traditionnel. Quatre scores de potentiel créatif ont été évalués : la pensée divergente graphique, la pensée divergente verbale, la pensée intégrative graphique et la pensée intégrative verbale.

Résultats – Les résultats montrent des corrélations négatives entre le niveau de potentiel créatif et la densité des textismes. Dans l'ensemble, les texteurs créatifs en pensée divergente produisent moins de textismes en rupture avec le code écrit traditionnel.

Conclusion – La discussion des résultats porte sur la flexibilité des texteurs et leur capacité à s'adapter ou à s'adresser de manière appropriée à leur interlocuteur.

Mots-clefs : SMS, textismes, créativité

1. Introduction

Over recent decades, the emergence of information and communication technology has been a turning point in how human beings communicate. With the advent of the mobile phone came a new form of communication: the SMS (Short Message Service), or text messaging. In 2012, text messaging celebrated 20 years of existence, yet text message communication between different mobile phone providers only became possible in 1999. Immediately and regardless of their country of residence, young people began to appropriate this new means of communication (Thurlow & Poff, 2013).

Text messages are particularly popular among young people. In 2017 in France, 12 to 17-year-olds were 57%, 18 to 24-year-olds 65% and 25 to 39-year-olds 54% to use text messaging app every day. Over the age of 40, the use of text messaging app became episodic: 40 to 59-year-olds are 62%, 60 to 69-years-old 79% and 92% for those over 70 years of age to never use text messaging app (Croutte, Lautié, & Hoibian, 2017). The situation is similar in most countries around the world. In the United States, in 2017, 44% of persons aged between 18 and 34 years stated that they use text messaging or online messaging applications from once to multiple times per day. Whereas 57% of persons aged over 55 years of age stated that they never use text messaging or online messaging applications (YouGov, 2018).

When writing text messages, young people no longer must employ refined language: using their imagination, they create a new way of writing that incorporates abbreviations or numbers in the transcription of words and sometimes expressions (Tossell, Kortum, Shepard, Barg-Walkow, Rahmati, & Zhong, 2012). Messages tend to become shorter (Goumi, Volckaert-Legrier, Bert-Erboul, & Bernicot, 2011) to accommodate imposed constraints (phone screen size and keyboard), with less respect given to grammar, spelling or conjugation. This new form of

written expression saves time and space (Volckaert-Legrier, Goumi, Bert-Erboul, & Bernicot, 2015) but is cognitively expensive to produce for novice users (Combes, Volckaert-Legrier, & Largy, 2012a, 2012b; Combes, Volckaert-Legrier, & Perret, 2018). From a scientific standpoint, this is rich material which opens up new research opportunities and questions for society.

1.1. Text messages

One of the language features of text messaging is its economy of characters resulting from the use of orthographic changes, thereby making this manner of writing so different from that which is traditionally used. The density of textisms is considered the reference index (e.g., Drouin & Driver, 2014; Grace, Kemp, Martin, & Parrila, 2014). A textism is defined as a change in a word's orthographic form compared to traditional writing. The density of textisms is equal to the number of changes divided by the total number of words in the message. Thurlow and Brown (2003) have proposed a 10-category classification for encoding these phenomena in the English language: shortenings (lab for laboratory), contractions (tmrw for tomorrow), g-clippings (mornin for morning), other clippings (wil for will), acronyms (DI for Detective Inspector), initialisms (ASAP for as soon as possible), letter/number homophones (l8r for later), misspellings (rember for remember), non-conventional spellings (nite for night), and accent stylizations (wivout for without). Grace and Kemp (2015) have provided an exhaustive report of other classification categories and examples of textisms in English. For the French language, Bernicot, Volckaert-Legrier, Goumi, and Bert-Erboul (2012) distinguished two types of textisms in terms of their accordance or rupture with the traditional written code. Textisms which, from a cognitive point of view, are consistent with the traditional code (grapheme-phoneme correspondence) involve a different application of the same rules: The orthographic changes do

not modify the phonology of the words and are written with graphic forms which exist in traditional writing (*donné* for *donner*, *lesson* for *leçon*, *chanbre* for *chambre*, *es* for *ai*). For textisms which break with the traditional code of grapheme-phoneme correspondence, different rules are applied or invented: The orthographic changes modify the pronunciation of the words and/or are written using graphic forms which do not exist in traditional writing (*mwa* for *moi*, *qi* for *qui*, *pk* for *pourquoi*, *chepa* pour *je ne sais pas*). The method section of the present study provides additional examples. Is the use of these orthographic modifications a sign of creativity? Or is it, instead, a sign of conformism? In order to answer these questions, we focused on texters' creative potential in relation to their spelling change behaviors (use of textisms).

Until now, studies have mainly focused on the links between writers' unconventional spelling (textisms) and literacy skills (e.g., Wood, Kemp, & Plester, 2014a; Wood, Kemp, Waldron, & Hart, 2014b). For children and teenagers, research has shown either no relation between the density of textisms and traditional spelling level (Plester, Lerkkanen, Linjama, Rasku-Puttonen, & Littleton, 2011; Plester, Wood, & Joshi, 2009), or a positive correlation (high density of textisms related to a good spelling level) (Wood, Jackson, Hart, Plester, & Wilde, 2011a; Wood, Meachem, Bowyer, Jackson, Tarczynski-Bowles, & Plester, 2011b). Other research has shown an absence of effect of text messaging on spelling (Kemp & Bushnell, 2011; Wood, Jackson, Plester, & Wilde, 2009). Bernicot, Goumi, Bert-Erboul, and Volckaert-Legrier (2014) as well as Zebroff (2018) have provided a synthesis of results in children and teenagers. Results seem to be somewhat different for adults. As for younger people, some studies show no association between literacy skills and textism use (Drouin & Davis, 2009; Kemp, 2010), others show positive relations between both literacy skills and frequency of text messaging (Drouin, 2011) and reading and writing text messages (Kemp, 2010). De Jonge and Kemp (2012) found a

negative relation between frequent text messaging, use of textisms and literacy skills in adults, a result which has never been shown in teenagers. Powell and Dixon (2011) show that spelling improves with exposure to textisms whereas exposure to misspellings has a negative effect on spelling ability. Wood et al. (2014a, 2014b) have provided a summary of these results in adults.

The new issue we have chosen to address here is the imagination and creativity of texters, solicited through their necessary adaptation to the tool. As of yet, no study has questioned the relation between texters' level of creative potential and the observed spelling changes in their text messages: Is 19 year-old Paul, "LO my bb how RU, dont no if UR awar ther's no psychopatho 2day" (*slm bb sava, jC pa si T o kourant mé ya pa psykopato ojrd8*), more creative than 19 year-old Manon, "I am in an introduction to health psychology class, it is great. We have to eat less meat!"(*Je suis en cours d'introduction à la santé en psychologie, c'est génial. Il faut qu'on mange moins de viande !*)?

1.2. Creativity

Throughout history, some people have been able to break existing standards in various fields to shed new light on our world (e.g., Galileo), make a scientific contribution (e.g., Einstein) or introduce a new artistic movement (e.g., Cézanne). These creators, with their influence on society, can be considered as having "big-C" creativity (Csikszentmihalyi, 2006; Kaufman & Beghetto, 2009). However, everyday people like us also have creative potential and are presented with daily "little-c" opportunities for being creative. Indeed, when a person (whether a child or an adult) is faced with a new situation without a solution, this person can choose a creative way to deal with it. Creativity is defined as the capacity to produce novel, original work which fits within the particular constraints of the task or domain (Amabile, 1996;

Lubart, Mouchiroud, Tordjman & Zenasni, 2015; Runco & Jaeger, 2012; Sternberg & Lubart, 1995). Thus, to be considered creative, an idea, a concept, a text or an artistic production must be distinguished from what has previously been proposed, while at the same time satisfying the constraints of the environment in which it is expressed (Besançon & Lubart, 2015).

Several components influence the creative potential of each individual. According to multivariate approaches (Sternberg & Lubart, 1995), creative potential refers to a particular combination of both individual resources (e.g., cognitive factors, referring to intellectual skills and knowledge, and conative factors, referring to personality traits, emotion and motivation) and contextual resources (e.g., the environment in which people live, referring to their culture, family, profession, and academic background). According to this approach, individual differences in creative potential become observable depending on the fit between the requirements of a given task and a person's multivariate profile of resources.

Moreover, two types of mental processes are involved in the creative process: divergent-exploratory thinking and convergent-integrative thinking (Barbot, Besançon & Lubart, 2016). Their proportion may vary from one individual to another (Barbot, Besançon & Lubart, 2011; Barbot et al., 2016; Runco, 2008). Divergent-exploratory thinking is the ability to generate a number of ideas related to a specific situation or stimulus (Barbot et al., 2011, 2016). Observations have shown that the more ideas people have (reflecting ideational fluency), the greater the probability they will obtain high-quality ideas. This explains why many psychometric measures of creative potential only derive a score of ideational fluency based on the number of ideas generated (Lubart et al., 2015; Reiter-Palmon, Forthman & Barbot, 2019). Divergent-exploratory thinking is often considered as an initial phase of the creative process (Csikszentmihalyi, 2006; Runco, 2008). It is characterized by a high level of flexibility

(Forthmann, Regehr, Seidel, Holling, Çelik, Storme, & Lubart, 2018a; Forthmann, Szardenings, & Holling, 2018b; Nusbaum & Silvia, 2011), a selective encoding capacity, an openness to novelty, and the willingness to observe problems from different angles. For a review on the development of Torrance's tests of creative thinking see Torrance (2004). In contrast, convergent-integrative thinking refers to the ability to elaborate and structure ideas appropriately (Barbot et al., 2016). In text messaging, texters must find an optimal solution for formulating their messages so as to be understood and to save on space. Furthermore, in convergent-integrative thinking tasks, individuals demonstrate an ability to select, compare and combine ideas in a coherent manner (Barbot et al., 2016). It is thus conceivable that integrative thinking may be used more than divergent thinking in the writing of text messages containing textisms.

1.3. Creativity in technology and writing

Lee and Chen (2015) have defined digital creativity as "the creativity manifested in all forms that are driven by digital technologies." Jackson, Witt, Games, Fitzgerald, von Eye, and Zhao (2012) observed the relations between children's use of four kinds of information technology (computer, Internet, video game and mobile phone) and their creativity (measured by the Torrance Test of Creativity-Figural, Torrance, 1987). The results showed no relation between mobile phone use and creativity. Yet the question remains: does a relation exist between the way text messages are written and creativity? To our knowledge, no study has yet examined the relation between the use of words whose spelling form has been changed compared to traditional writing (textisms) and the creativity of the writers (texters), even though the use of such modifications is characteristic of this kind of writing.

At the beginning of text messaging, texters were faced with several constraints: a limitation on the number of text messages they could send each month and a pecuniary cost per text message sent. Therefore, texters looked for ways to save both money and time by making orthographic changes to traditional writing when texting (Volckaert-Legrier et al., 2015). Since today's constraints are no longer the same, do the orthographic changes observed in text messages reveal the writers' creativity or are they simply adaptations? The present study makes the assumption that the way in which text messages are written is a technology-driven form of creativity.

Wang (2012) has explored the impact of intensive reading and writing practice on the creative performance of Taiwanese students. The Abbreviated Torrance Test for Adults (ATTA, Goff & Torrance, 2002) was used to evaluate the students' creative performance. Students who read and wrote the most performed better in the verbal and graphic domains of divergent thinking (TTCT). These study results suggest that reading and writing practice impacts the creative potential of divergent thinking.

Ritchie, Luciano, Hansell, Wright, and Bates (2013) assessed reading, spelling and creativity in adolescents and young adults. Reading and spelling skills were assessed using the Components of Reading Examination by Bates, Castles, Coltheart, Gillespie, Wright, and Martin (2004). Creativity was assessed by means of the Openness to Experience scale (Wainwright, Wright, Luciano, Geffen, & Martin, 2008) and a creative writing task (based on visual and/or written stimuli provided to the participant for the drafting of a creative writing sample) designed by Wainwright, Wright, Luciano, Geffen, and Martin (2005). This research showed that higher creativity scores were associated with higher spelling and reading scores (poor reading or spelling was associated with lower scores on measures of creativity).

1.4. Hypotheses

The main purpose of the present study was to focus on a new variable: texters' level of creative potential. Specifically, we explored how changes in words' orthographic forms in text messages are related to creativity.

Ritchie et al. (2013) demonstrated that the more creative a person is, the better the person is at reading and spelling. A vast number of studies have also shown that the more textisms a person makes, the better speller that person is (e.g., Wood et al., 2014a, 2014b). We based our general hypothesis upon these study results, proposing the existence of a positive relationship between the density of textisms and creative potential: The more texters changed how they spelled words when writing text messages (measured by the density of textisms breaking with the traditional written code), the more creative they would be (measured by divergent and integrative thinking).

Some prior studies have considered text messaging as a form of exposure to text that could train literacy skills such as reading or writing (Plester & Wood, 2009; Plester et al., 2009; Powell & Dixon, 2011). Wang (2012) has also suggested that extensive practice in reading or writing has an impact on divergent thinking. Taken together, these findings suggest a correlation between writing text messages with a high density of textisms breaking with the traditional written code and a high level of exploratory thinking (Hypothesis 1).

Alternatively, writing text messages with a high density of textisms breaking with the code could be related to integrative thinking (Hypothesis 2). This can be explained in two ways: First, when writers use textisms breaking with the code, they change words' orthographic form compared to traditional writing. In so doing, they apply or must invent their own new rules from

the traditional code of grapheme-phoneme correspondence (Bernicot et al., 2014). Second, when individuals combine, compare and select ideas in a coherent manner, they demonstrate a high level of convergent-integrative thinking (Barbot et al., 2016) and elaborate and structure their ideas correctly (Barbot et al., 2016).

2. Method

2.1. Participants

Twenty-nine undergraduates (24 females, 5 males) participated in the study (M_{age}= 21.2 years, SD_{age}= 1.6 of a year). They were recruited from a public university located in the western suburbs of Paris (France). The proportion of females was typical of the introduction to psychology course in which they were enrolled and similar to that of other text messages studies (e.g., De Jonge & Kemp, 2012; Drouin & Davis, 2009; Kemp, 2010). The participants received no course credit and their participation in the study was voluntary. The researchers guaranteed the participants' anonymity at every stage of the study. The participants provided their written consent and agreement. All the participants were native French speakers, had owned a mobile phone for an average of 8 years (*SD* = 2 years), and 25 of the mobile phones were smartphones.

2.2. Materials

2.2.1. Text messages

Participants used their own mobile phones to write and send text messages. A computer server was used to collect text messages written by the participants.

2.2.2. Creativity

We used the "Evaluation of Potential of Creativity" battery (EPoC, Lubart, Besançon, & Barbot, 2011) as a means of measurement. According to the authors, creativity is a multifaceted, domain-specific construct. Therefore, instruments to measure creativity may vary depending upon the domain component being measured (e.g., literacy/verbal domain or graphic/figural domain).

In the divergent-exploratory thinking tasks, test-takers were asked to generate as many drawings as possible (graphic domain), or as many stories as possible (verbal domain). Each task was limited in time (10 minutes). Conversely, the convergent-integrative tasks required test-takers to produce a complete, original drawing (graphic domain), or a complete story (verbal domain) (see Table 1).

<Insert Table 1 about here>

All divergent-exploratory thinking tasks were scored according to the index of fluency (number of different ideas). The convergent-integrative tasks were assessed using the Consensual Assessment Technique (CAT, Amabile, 1982) and were rated by at least two independent and qualified judges (the creative productions were evaluated according to a set of defined rubrics[1], ranging from "1-Low creativity" to "7-High creativity"). Three raters (M_{age} = 38.9; SD_{age} = 4.7 of a year), university professionals who work regularly in the field of creativity, assessed the creativity of the story and drawing. The inter-rater reliability was good ($\alpha > .75$) for the four

[1] For example, a score of "1" in the graphic integrative task corresponds to the rubric "very poor, complete lack of ideas" whereas a score of "7" corresponds to "a very original idea encompassing all elements". For the verbal integrative task, a score of "2" means "a story including banal or traditional ideas" and a score of "7" corresponds to "an original, well-crafted story rich in details".

integrative tasks (αIGAbstract = .86; αIGConcrete = .82; αIVTitle = .77 and αIVCharacters = .78).

The creative score for the eight tasks was then transformed into a z-score to ensure a better comparison between the various tasks. Following Lubart et al. (2011), we calculated four creative potential scores for each participant: "graphic divergent thinking" (GDT), "verbal divergent thinking" (VDT), "graphic integrative thinking" (GIT) and "verbal integrative thinking" (VIT).

2.3. Procedure

In a first session, the study was presented to the participants. They then signed a consent form guaranteeing the anonymous treatment of the data and filled in a short questionnaire about their phone use (how long they had owned a mobile phone as well as the brand and model of their phone). All the sessions took place in a collective setting.

2.3.1. Text message collection

In two sessions, one week apart, participants were invited to send text messages from their own mobile phone to a free phone number corresponding to a computer server. As part of the first session, they were asked to select 20 messages of their choice. These messages were to be ones they had written themselves, sent in daily-life situations and which were therefore still stored in their own phones. They were asked to choose messages they had written and sent within the three months leading up to the study to ensure that the way they wrote the text messages was not influenced by the study. Each participant was assigned a code to ensure their anonymity when sending in their messages. Twenty-nine participants took part in this first

session, resulting in the collection of 580 naturalistic text messages. In the second session, participants were asked to write text messages from 10 scenarios presented in notebooks (see Appendix) and created by the researchers according to the procedure described by Plester et al. (2009). The order of the 10 scenarios was counterbalanced and they were preceded by an example which was not included in the results (e.g., Write a text message saying "We will be late because there are disruptions on the subway line"). Participants had one minute to write each text message according to the following instruction: "Imagine you are sending it to a loved one (someone you know well)". The participants used their usual text-input mode (multi-press or predictive). Twenty-nine participants took part in this second session which resulted in 285 elicited text messages.

2.3.2. Evaluation of creative potential

In two sessions, one week apart, the participants collectively took the EPoC battery (Lubart et al., 2011). At both sessions, four types of exercises were proposed: The first two exercises involved divergent thinking tasks, in which participants were asked to produce many ideas from one stimulus, in both the graphic and verbal domains. The second two exercises involved integrative thinking tasks, first in the graphic domain and then in the verbal domain.

2.4. Analysis and coding of the textisms

A text message corpus was created in order to analyze the textisms. Each text message arrived directly in its own Excel™ file cell and was then coded by category (according to the French-language analysis grid by Bernicot et al., 2012). A word could be classified in only one category. For each original text message, Excel™ automatic counting formulas were used to

record the number of characters (including spaces) as well as the number of words (strings of letters separated by two spaces).

Two text message indexes were considered: length (number of characters including spaces and number of words) and density of textisms. While text message length was not an index in this study, it was useful in providing a description of the purpose of the study analyses.

A textism is defined as a change in a word's spelling form compared to traditional writing (e.g., Drouin & Driver; 2014; Grace et al., 2014). The density of textisms for each text message was equal to the number of changed words divided by the total number of words in the text message. Two types of textisms were identified with regard to their consistency or their breaking with the traditional written code (Bernicot et al., 2012). Table 2 contains coding examples.

<Insert Table 2 about here>

A coder-agreement index was measured from 100 randomly selected text messages containing a total of 440 textisms. The index was defined as the number of textisms coded in the same way by two coders divided by the total number of textisms coded. For the coding of the various types of textisms into categories, the intercoder agreement was greater than 80%.

3. Results

3.1. ~~Descriptive results of text messages~~ Comparison between the two corpora

We compared the means between naturalistic and elicited text messages, using *T*-tests for dependent samples, for text messages length and for density of textisms (see Table 3).

<Insert Table 3 about here>

As there was no difference between the two corpora of text messages for length and for density of textisms, we conducted the next statistical treatments for all text messages combined, independently of the corpora. To combine the two corpora, we excluded two participants who did not give either naturalistic or elicited text messages.

3.2. Relations between textisms and creativity

The correlations (Bravais Pearson's r) between the density of textisms and the creativity scores (see Table 4) were analyzed.

<Insert Table 4 about here>

Five correlations were negative and significant. Three of the correlations concerned textisms breaking with the code and graphic divergent thinking (r = -.390, p < .05), verbal divergent thinking (r = -.478, p < .05) and verbal integrative thinking (r = -.421, p < .05): The participants who produced textisms breaking with the code had a lower graphic and verbal divergent and verbal integrative thinking score on the EPoC test, and conversely. Two correlations concerned textisms from all categories combined and verbal thinking (r = -.395, p < .05 for verbal divergent thinking; r = -.439, p < .05 for verbal integrative thinking): The more textisms (all categories combined) students produced, the lower their creative potential was in verbal divergent and integrative thinking, and conversely.

For significant correlations, regression analyzes were conducted to examine the extent to which participants' creativity level could explain a significant amount of variance in density of textisms. In accordance with our hypotheses, we entered separately divergent and integrative thinking as the predictor variables. For textisms breaking with the code, graphic and verbal divergent thinking explained together 16.4% of the variance in the density of textisms breaking

with the code (R^2 = .164, F (2, 24) = 3.557, p = .044). None of the two predictors made a significant contribution: nor graphic divergent thinking (β = -.036, p = .904), nor verbal divergent thinking (β = -.450, p = .136). Verbal integrative thinking explained 14.5% of the variance in the density of textisms breaking with the code (R^2 = .145, F (1, 25) = 5.397, p = .029). For textisms all categories combined, verbal divergent thinking explained 12.2% of the variance in the density (R^2 = .122, F (1, 25) = 4.617, p = .042) and verbal integrative thinking explained 16.0% of the variance in the density (R^2 = .160, F (1, 25) = 5.966, p = .022).

4. Discussion

The purpose of the present study was to explore the relationship between orthographic changes (textisms) observed in text messages and the potential level of creativity of text-message writers (texters). Based on studies of creativity (Lubart et al., 2015; Ritchie et al., 2013; Wang, 2012) and textisms (e.g., Bernicot et al., 2012; Bernicot et al., 2014; Plester & Wood, 2009; Plester et al., 2009; Wood et al., 2014a; Wood et al., 2014b) we expected to discover a positive correlation between the density of textisms breaking with the code and creative potential in both divergent thinking and integrative thinking. The results of this study contradicted our expectations: Of the 12 possible correlations between textisms and creativity that were tested, 5 were significant, but always negative. In other words, our research suggests that the more textisms participants used, the less creative they were, and vice-versa. However, in accordance with our hypothesis, we found that the majority of these 5 correlations (3) concerned textisms which broke with the traditional written code. The significant results for textisms from all categories combined were probably due to textisms breaking with the code, as the results for textisms consistent with the code were not significant.

According to Hypothesis 1 and contrary to Hypothesis 2, two correlations concerned textisms breaking with the traditional code of phoneme–grapheme correspondence and the divergent-exploratory thinking process. Textisms breaking with the code are the most specific of the text-messaging register and are created using graphic forms which do not exist in traditional writing (spelling changes modify the phonology of words). From a cognitive point of view, these textisms involve the invention of new rules (Bernicot et al., 2012, 2014). In the same manner, the divergent-exploratory thinking process corresponds to the ability to produce numerous ideas related to a specific stimulus (Barbot et al., 2011; Barbot et al., 2016).

To further investigate the relationship between density of textisms and creative potential, we then conducted regression analyses based on the significant correlations. Following our hypotheses, we asked whether density of textisms could be predicted by divergent or integrative thinking. Regression analyses revealed that the density of textisms breaking with the code is mainly explained by divergent thinking, whatever the domain (verbal or graphic), as well as the verbal integrative thinking; moreover, the density of textisms all categories combined, is mainly explained by the creative potential in verbal domain, whatever the kind of creative thinking. So, it seems that it is not the kind of creative thinking (integrative-convergent or divergent-exploratory), but rather the type of domain (verbal or graphic) that could explain the density of textisms.

There are several possible explanations for the results of the present study. First, the texters who used textisms breaking with the code would also have had a relatively low level of flexibility, which is linked to a low level of creativity (Forthmann et al., 2018a, 2018b; Nusbaum & Silvia, 2011), particularly in divergent thinking (Barbot et al., 2011, 2016; Barbot, Besançon, & Lubart, 2015; Besançon, Barbot, & Lubart, 2011; Wang, 2012). In contrast, it would follow

that the texters who did not use textisms breaking with the code would have been more flexible, despite possessing a high level of creativity. Nevertheless, at this stage, this is only a hypothesis. Indeed, usually, divergent-exploratory thinking tasks are scored for fluency, flexibility and originality (Reiter-Palmon et al., 2019) and these scores are interrelated (Forthmann et al., 2018a, 2018b; Nusbaum & Silvia, 2011). In this study, our divergent thinking tasks were scored according to the EPoC Manual (Lubart et al., 2011) only with fluency (number of different ideas) and the level of flexibility of the participants has not been measured yet, nor was the originality. In line with this, it will be interesting to explore the flexibility and the originality of textims for each participant (do they always use the same type of textims –intra-individual variability–? How original are each textim?). Moreover, it will be necessary in another study to add some standardized measures of executive functions (e.g., flexibility, inhibition and processing speed) as well as some control for the texters' level of vocabulary (Anderson & Reidy, 2012; Miyake & Friedman, 2012; Van Dijk, Van Witteloostuijn, Vasić, Avrutin, & Blom, 2016).

A complementary explanation can be linked to adaptation (with regard to the texter's interlocutor). A creative production must be adapted to the constraints of the given situation (Besançon & Lubart, 2015; Caroff & Besançon, 2008; Runco & Jaeger, 2012). This proposal is somewhat speculative, since we did not ask to the participants their opinions regarding the appropriateness of textisms. But it can be supported by experiments in which participants were asked to share their opinion regarding the appropriateness of textisms (Drouin, 2011; Drouin & Davis, 2009; Grace et al., 2014; Grace, Kemp, Martin, & Parrila, 2015). Drouin and Davis (2009) examined this process and demonstrated that 75% of participants said using textisms was appropriate in an informal environment whereas 6% considered it to be appropriate in a formal environment. In the study by Drouin (2011) students reported using textisms less in formal

contexts and more in informal contexts. Such results were confirmed by Grace et al. (2015) who showed that the more formal the situation was, the less appropriate participants found the use of textisms. In the study by Grace et al. (2014), students considered the use of textisms in text messages to be appropriate. The authors found that the more students used textisms in their naturalistic text messages, the more they believed it was appropriate. In the present study, it is possible that the participants with little creativity who used textisms breaking with the code did so because they found it appropriate. Creative participants who did not use textisms breaking with the code may have done so because they found it inappropriate and therefore chose not to make use of their creativity. The participants may have had the potential for creative writing, textism use and unconventional writing, but may have deliberately chosen to be more conventional (Drouin, 2011; Drouin & Davis, 2009).

However, since the participants in the present study were not asked for their opinion regarding textisms, an alternative interpretation may be suggested regarding the age of the participants. Ling (2010) analyzed data from six surveys in Norway (from 2001 to 2007, participants over the age of 13) and found texting to be a life phase phenomenon: as teens move into young adulthood, they tend to use text messaging to a moderate extent, instead of in the intensive manner of their teenage years. In the same vein, Kemp, Wood, and Waldron (2014) reported a spike in the use of nongrammatical text abbreviations in secondary school students (mean textism density = .41) as compared to primary school students (m = .28) and university students (m = .20). Globally, the use of textisms decreases with the entry into adulthood and the studies carried out with young adults show percentages of textisms in agreement with ours: .22 for Kemp (2010) and .24 for Drouin and Driver (2014). As the participants of our study were

young adults, it can be assumed they were using fewer textisms and not fully making use of their creative potential. This will have to be confirm in another study with secondary school students.

4.1. Limitations and directions for future research

To our knowledge, this is the first study to investigate creativity in text messaging and it presents a certain number of limitations. First, at only 29 participants, the sample size could be criticized for limiting generalizability. The main purpose of this study was to provide a preliminary investigation of the relations between textisms and creativity. Yet the hypotheses of this study were based, on the one hand, on previous textism studies (Bernicot et al., 2012, 2014; Plester & Wood, 2009; Plester et al., 2009; Wood et al., 2014a, 2014b), and, on the other hand, on studies of creativity (Lubart et al., 2015; Ritchie et al., 2013; Wang, 2012). Future studies should undoubtedly examine textisms and creativity using larger sample sizes to improve and extend the generalizability of the present findings. This study may be considered as a first step before a replication with a larger group of participants. A second limitation involves the percentage of female participants (82.76%). While high, this rate is similar to that of other studies on text messages (e.g., 70% for Drouin & Davis, 2009; 78% for Grace et al., 2015; 82% for Kemp, 2010) and is typical of the introduction to psychology course in which the participants were enrolled. Consequently, future studies should extend and support the present findings using more male participants.

Further research is called for in this area. An initial direction might be the replication of this study with teenagers, adding standardized tests for measuring texters' level of flexibility, inhibition and processing speed with the goal of confirming our interpretations. If such a replication is carried out, control will need to be established for the texters' level of vocabulary.

We also plan to ask participants' opinions regarding the appropriateness of textisms. Furthermore, since (1) text messaging is a social means of communication and (2) creativity is heavily linked to domains such as the social domain, it would be worthwhile to assess participants' social creative potential. Finally, it will also be pertinent to focus on textisms' originality, a factor which will be measured according to the rarity of the textisms' occurrence. This assessment of originality could be measured statistically by first studying the frequency of occurrence of each textism and then requesting a consensual assessment from individuals whose characteristics match those of our sample.

Despite these limitations, the authors of the present study consider understanding creativity in text messaging as useful for the study of new factors to explain this type of writing. In the field of social learning (i.e., learning from others), a study could be carried out on the propagation and appropriation of linguistic innovations through the practice of text messaging in a population of youth. In addition, the scope of orthographic changes could be examined: Are they characteristics of individuals themselves (mini c), of the individuals' interaction with their immediate environment (small c) or have these characteristics been taken over by society at large (big C, such as "LOL")? In this final case, once the textism has been released into the public domain, how should it be considered when individuals use it: as creative or merely appropriate?

Les auteurs déclarent ne pas avoir de liens d'intérêts.

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Table 1 – EPoC structured framework for task sampling

Domain	Thinking process	
	Divergent-Exploratory	Convergent-Integrative
Graphic	DG1 – Abstract stimulus DG2 – Concrete stimulus	IG1 – Abstract stimuli IG2 – Concrete stimuli
Verbal	DV1 – Story endings DV2 – Story beginnings	IV1 – Story title IV2 – Story characters

Table 2 – Examples of textism categories consistent with or breaking with the traditional French written code of phoneme-grapheme correspondence (*Examples of English equivalents found in Thurlow & Brown, 2003 and Wood, Kemp & Plester, 2014)*

Textisms consistent with traditional code of phoneme-grapheme correspondence			
Categories	Simplifications	Complexifications	Substitutions
Examples (transcriptions into traditional French)	*monai (monnaie), foto (photo), koi (quoi)*	*creuver (crevé), cafer (café), serais (serai)*	*arriver (arrivée), pence (pense), mademoizelle (mademoiselle)*
English equivalent	stres (stress), wil (will), wher (where)	shapping (shaping), leade (lead), chairs (chair)	there (their), bloo (blue), cuming (coming)

Textims breaking with traditional code of phoneme-grapheme correspondence				
Categories	New phoneme-grapheme correspondences without phonological modification	Agglutinations	Phonological modifications	Words or graphic forms not existing in traditional French
Examples (transcriptions into traditional French)	*n8 (nuit), je V (je vais), CT (c'était), 2min (demain)*	*vasy (vas-y), jtdois (je te dois), dla (de la), tle (te le)*	*vac' (vacances), tkt (t'inquiètes), doc (docteur)*	*x-x (smiley), troplolol, ouf (fou), zzzz, daron (père)*

English equivalent	l8 (late), 2night (tonight), RU (are you)	alot (a lot), whatsup (what's up)	Mon (Monday), pls (please), bout (about)	X (kiss), LOL (laugh out loud/lots of love)

Table 3 – Comparison of naturalistic and elicited corpora on text messages length and density of textisms

	Naturalistic text messages		Elicited text messages			
	M	*SD*	M	*SD*	*t*	Cohen's *d*
Nber of Words	16.867	5.446	19.950	5.763	-1.807 *(ns)*	.055
Nber of characters	83.780	29.011	98.134	27.367	-1.690 *(ns)*	.509
Textisms consistent with code	0.076	0.059	0.080	0.064	-0.357 *(ns)*	.067
Textisms breaking with code	0.186	0.094	0.166	0.101	1.083 *(ns)*	.210
Textisms all categories combined	0.262	0.135	0.246	0.142	0.654 *(ns)*	.118

Table 4 – Correlations (Bravais Pearson's r) between density of textisms and creativity scores

	Graphic divergent thinking	Verbal divergent thinking	Graphic integrative thinking	Verbal integrative thinking
Textisms consistent with code	−.021	−.156	−.118	−.342
Textisms breaking with code	−.390*	−.478*	−.100	−.421*
Textisms (all categories combined)	−.276	−.395*	−.121	−.439*

*$p < .05$