New Zealand text-speak word norms and masked priming effects

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Text messaging and online instant messaging are popular means of communication in New Zealand. Given the constraints of space and time, people use text-speak (a method for shortening words or phrases) to convey messages more concisely (Head, Helton, Neumann, Russell, & Shears, 2011). The current study collected text-speak word norms from 100 native New Zealanders. An abridged sample of these subset text-speak words (e.g., txt, text) was used within a masked priming experiment. It was found that subset primes produce significantly faster and more accurate responses to target probes relative to non-words in a lexical decision task. A text-speak questionnaire was given to determine if a relationship between subset priming and experience with text-speak exists. The questionnaire revealed that those who reported being more experienced with text-speak benefited more from text-speak primes than those who reported being less experienced.

Short Message Service (SMS), more commonly known as "text messaging", was originally only intended for cell phone companies to communicate with customers (Agar, 2003; Wray, 2002). In the past decade, however, text messaging has become an increasingly preferred mode of communication, most notably among young adolescents (Madell & Muncer, 2004; Tagliamonte & Denis, 2008). Although New Zealand is a small country with around 4.3 million people, it has approximately 4.6 million mobile phone subscribers, which can be attributed to some people owning more than one phone (CIA, 2009). On average over a million text messages are sent daily within New Zealand (Bramley et al., 2005).

Communication mediums, such as text messaging and Twitter, limit the space available to communicate a message. For example, mobile phone service providers generally limit a text message to 160 characters (i.e., letters and spaces) per message (Berger & Coch, 2010), while Twitter limits messages to 140 characters (Dorsey, 2012). Limited space has prompted users of these communication mediums to use shortening techniques such as text-speak (e.g., great to see you, **gr8 2 cya**). However, it should be noted that limited space is not the single catalyst prompting the use of text-speak. Text-speak has also been noted in other communication mediums where relative space is not as limited, such as blogs, forums and community social networks (e.g., Facebook and MySpace), and emailing (Crystal, 2008; Drouin & Davis, 2009). Additionally, as pointed out by a reviewer, participants may adopt using text-speak in order to better mimic face-to-face communication. Thus, participants may likely adopt text-speak to allow faster and greater "spontaneity" in conversation.

Text-speak includes various techniques employed to shorten a word or phrase. Some popular text-speak techniques include acronyms (Laugh Out Loud, **LOL**), shortcuts (late, *L8*), phonetic respelling (night, **nite**), nonconventional spelling (at you, **atcha**) and removal of vowel or consonants (subsetting) (text, **txt**) (Choudhury, et al., 2007; Ganushchak, Krott, & Meyer, 2010; Head, Helton, Neumann, Russell, & Shears, 2011; Plester, et al., 2011; Thurlow, 2003).

Most of the research on text-speak to date has focused on the detrimental effects text-speak has on literacy. Critics of text-speak have argued that it is counterproductive to language production for students (Thurlow, 2006; Sutherland, 2002; Ihnatko, 1997), while others have argued that text-speak has no negative effects (Crystal, 2008; Drouin & Davis, 2009; Kul, 2007). Regardless of either viewpoint, both sides have based their arguments on non-experimental evidence (e.g., correlations) which makes it difficult to truly understand the effects text-speak may have on comprehension. The use of text-speak by New Zealand students has also generated disdain among educators. For example, concerns arose when examination markers penalized students for using text-speak in formal examinations by awarding them lower scores. Controversially, the New Zealand Qualifications Authority (NZQA) moved to allow students to use text-speak in formal exams due to its widespread use and appearance in examinations. The NZQA's argument was that regardless of whether text-speak was used, if the student shows the required knowledge of a subject, then they should be given credit. As expected this was met with anger from educators; for example, one school principal stated, "permitting text abbreviations in the National Certificate of Educational Achievement exams made a joke of the teaching of proper grammar" (Smith, 2006). As noted above, research addressing the use of text-speak and its effects on literacy and grammar is ongoing (Thurlow, 2006; Sutherland, 2002; Ihnatko, 1997); however, the focus of this study is how text-speak is created and more importantly what are the cognitive mechanisms involved in processing this type of information.

Researchers have investigated how people process text-speak word representations using conscious and unconscious priming techniques in the UK, USA, and Spain (Ganushchak, Krott, Frisson, & Meyer, 2011; Head, Shears, Helton, & Neumann, in press; Perea, Acha, & Carreiras, 2009). Conscious priming involves a visible brief exposure of a stimulus that enhances or prepares a participant's overt response (Anderson, 2005). Unconscious priming (i.e., masked priming) works on the same principle as conscious priming; however, the prime is exposed very briefly (less than 50 msec) and is followed by a mask (Grainger, & Segui, 1990). The brief prime exposure coupled with the mask gives the appearance of a flicker on the screen. Generally, participants are unable to consciously perceive what is shown on the screen (Forster, 1998). Recently research has also begun addressing text-speak processing specifically in New Zealand (Head, Helton, Russell, & Neumann, 2012; Head, Russell, Dorahy, Neumann, & Helton, 2011).

The use and processing of text-speak can be understood from a cost-benefit perspective. The use of text-speak provides the user with the benefit of shortening a message to convey it more quickly and in less space. However, this benefit for the writer comes at a cost for the reader of the message. The reader of a text-speak message has to extract meaning from a compressed and unfamiliar symbol combination, which results in a processing cost resulting in increased error rates and longer comprehension times (see Head, Helton, Russell, & Neumann, 2012). Various studies have recently begun to examine the cognitive costs of processing text-speak.

Eye tracking studies have shown that when someone is reading text-speak, their eyes fixate longer on text-speak items (Ganushchak, Krott, Frisson, & Meyer, 2011). Additionally, readers of text-speak have reduced reading speed when trying to comprehend sentences composed of text-speak comparatively to sentences composed of correctly spelled words (Ganushchak,et al., 2011; Perea, Acha, & Carreiras, 2009). Longer fixations and reduced reading speed were indicative of increased cognitive demand placed on the reader (Reilly & Radach, 2006; Salvucci, 2001). This increased demand may in part arise because text-speak abbreviations do not have the same level of automatic activation as correctly spelled words. Meaning is generally considered to be extracted automatically from correctly spelled words which also captures the attention of readers (Johnson et al., 1990; Stroop, 1935), however, the same cannot be said for text-speak. Head, Russell, Dorahy, Neumann, and Helton (2011), for example, presented participants with correctly spelled words and subsets within a sustained attention task. Rare target words presented in text-speak were responded to more slowly and were more difficult to detect than correctly spelled words. Moreover, participants who reported having less experience using text-speak were less accurate and took longer to detect text-speak targets than those reporting greater experience in the use of text-speak.

Conscious priming experiments have shown that although text-speak possesses lexical representations as evident from the interference it causes in parity decision tasks (Ganushchak, Krott, & Meyer, 2010); text-speak items are more difficult to incorporate semantically within a sentence. Indeed, Head et al. (in press), found that participants had impaired performance when trying to integrate text-speak target probes with sentence primes in a sensibility sentence task. Further, Head, et al., (2012) investigated the cost of processing text-speak within a dual-task paradigm. Participants were presented with either a story composed of text-speak words or a story that was composed of correctly spelled words while simultaneously monitoring for tactile stimuli around their abdomen. Head et al. (2012) found that when participants were reading a text-speak story, they were less accurate and responded more slowly to the tactile stimuli than they did when reading correctly spelled stories. Head et al. argue that this increased response time and error rate demonstrate that text-speak places greater cognitive demands on readers than correctly spelled text. Readers are not only presented with subset representations, but also a host of other text-speak representations (e.g., Can you come over tonight please? **Cn u cm ova 2nite pls?**). Given that sentences presented in Head, et al. were presented in various other forms of text-speak besides subset words, it is difficult to determine whether subset items in their own right exact a cognitive processing cost. Subset words, in comparison to other forms of text-speak, are more word-like and may be easier to read (e.g., txt-text vs. 2nite-tonight). Consequently, it is difficult to rule out that subset words may have been treated as complete words and thus did not exact a cognitive cost to the reader. Collectively, the studies above show that consciously processing text-speak is difficult and may exact a cognitive cost from the reader. However, it is not known whether these cognitive costs are mediated by consciously processed context effects of sentences and whether subset words specifically exact a cognitive cost to the reader.

Reading sentences composed of correctly spelled words can arguably lead to automatic top-down conscious spreading activation of words and the concepts they entail (Balota, 1983; Neely, 1977). Text-speak, coupled with correctly spelled words, may provide the reader with enough context to facilitate correctly spelled word activation for text-speak word representations. Thus, context contamination, may make it difficult to determine whether text-speak words isolated from context have semantic meaning in their own right.

One prominent method of avoiding the influence of sentence context on words is the masked priming technique (Berent & Perfetti, 1995; Dehaene et al., 1998; Forster & Davis, 1984, Forster, & Davis, 1991; Grainger & Segui, 1990; Perea & Gomez, 2010; Perea & Gotor, 1997). This technique comprises a very brief presentation of a prime stimulus (typically 30-50 ms) followed immediately by either a short duration post mask or a more enduring probe stimulus, which both serve to terminate the effective visibility of

Figure 1. Example of font change presentation for a subset prime and target probe

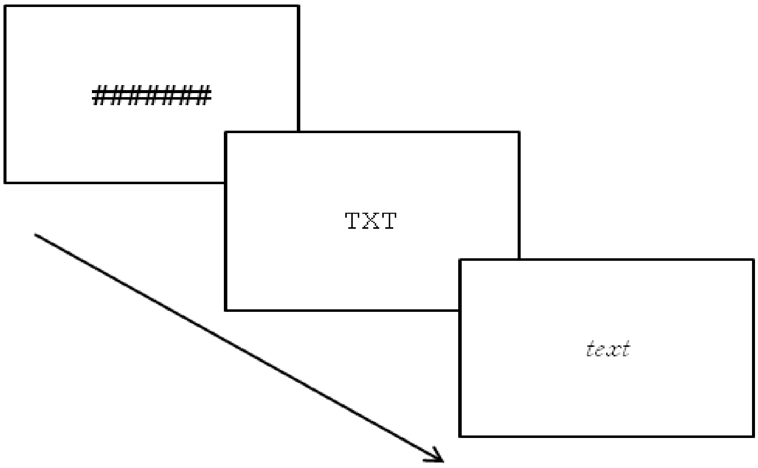


Figure 2. Reaction time for correct responses, error bars depict standard error of the mean

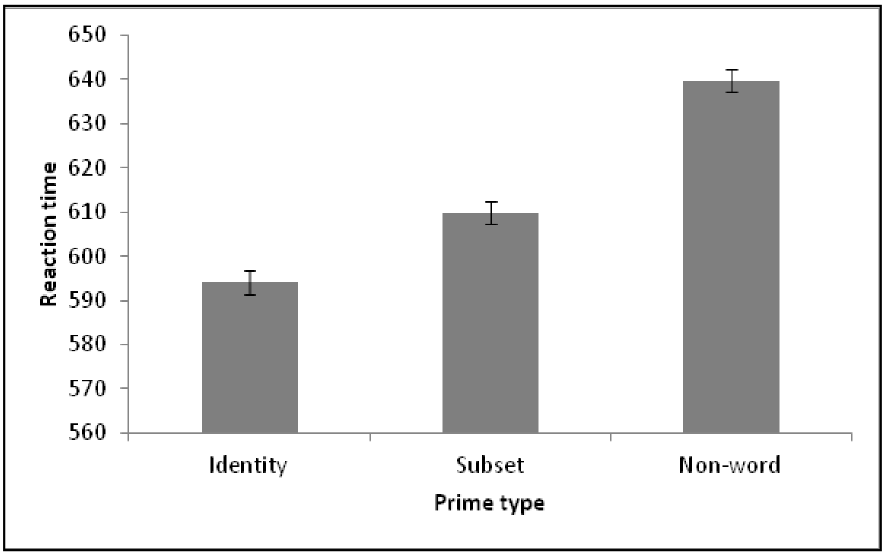
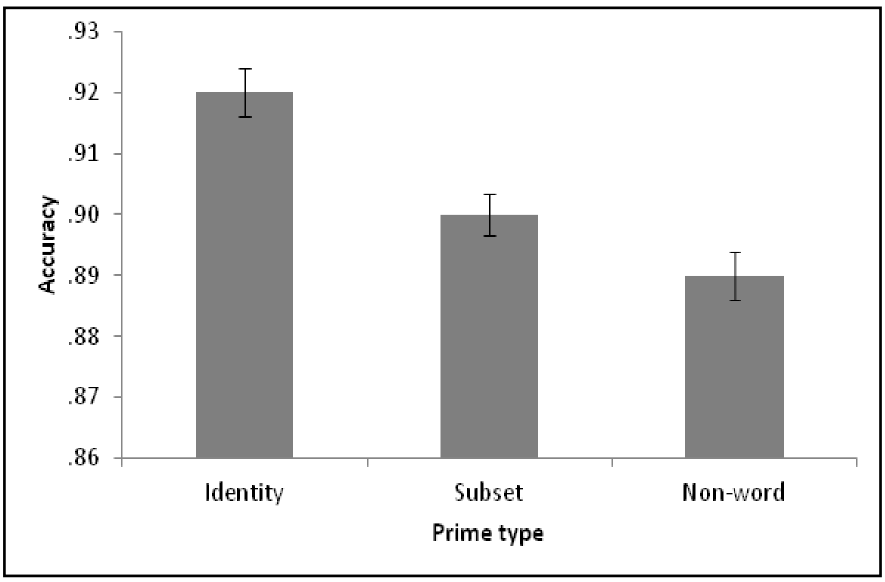


Figure 3. Proportion correct for prime conditions, error bars depict standard error of the mean



the prime. Commonly participants are required to make word/non-word decisions (lexical decisions) to probe stimuli. Interest focuses on the effects of the prime on probe lexical decision times. Since the goals of research relate to the extraction of meaning from the primes, prime and probe stimuli are frequently presented in different cases (uppercase and lowercase) to exclude physical identity as an explanation of priming effects. The major advantage of masked priming techniques is that they permit the investigator to examine lexical priming in the absence of conscious awareness of the primes (see, e.g., Bodner & Masson, 2003; Bourassa & Besner, 1998; Perea & Gomez 2010; Perea & Gotor, 1997; Perea & Lupker, 2003).

The masked priming technique has already been used with text-speak words and has generated reliable priming effects (Head, Helton, Neumann, Russell, & Shears, 2011). Head, Helton, Neumann et al. (2011) were able to show that subset text-speak words (e.g., text, **TXT**) may perhaps possess lexical meaning. Participants within a masked priming experiment responded faster and more accurately to target words preceded by subset primes (text, **TXT**) relative to non-word primes (text, **YFT**). Additionally, subset prime words produced only marginally less accurate and slower responses than correctly spelled words in the identity condition (text, **TEXT**). Although the results are compelling, some caution is warranted regarding whether lexical processing for masked subset primes did occur. Specifically, many upper- and lower-case words share the same grapheme features (e.g., Cc, Kk, Mm, Oo, Uu, Xx). Thus, it is possible that participants were subconsciously benefitting from feature matching instead of lexical representation when making lexical decisions. Indeed, previous investigations have shown font size and type may have influences in how we process words (Chancey, Holcomb, & Grainger, 2008; Majaj, Pelli, Kurshan, & Palomares, 2002).

An extensive literature search has not revealed a published text-speak word norm stimuli list and specifically not one for New Zealand. Although some anecdotal text-speak websites exist (e.g., www.lingo2word.com), their data collection and actual results are questionable. Additionally, these types of websites do not take regional colloquialisms into consideration. In other words, native New Zealanders may use different text-speak representations than natives of the USA or Canada. Thus, because we believe that text-speak processing is a fertile venue for future studies; it is useful to provide objective New Zealand text-speak word norms for future investigations. Additionally, we wanted to empirically investigate a specific form of text-speak (i.e., subset) processing using these acquired norms in a masked priming experiment.

The present experiment was designed to provide further corroboration that subset text-speak items can convey meaning in the absence of top-down and contextual influences. Additionally, we wanted to address some issues raised in Head, Helton et al. (2011). First, we address concerns that grapheme feature overlap was possibly driving the priming effects reported. To address this, we added a font change condition in which the *prime* was presented in Bell MT italicised and the target probe in Courier font (e.g., `FINALLY`-`finally`). Second, Head, Helton et al., failed to show significant correlations of age and sex with priming magnitude. Indeed, it has been noted that young adolescents use text-speak more than adults (Crystal, 2008). The absence of significant correlations between age and magnitude in Head, Helton, et al. may in part have been due to the small sample size used in the correlation (n = 87). Thus, to increase statistical power, we significantly increased the sample size of the current study (n = 416). We predict that younger people will have greater experience with text-speak and thus will benefit more from the text-speak prime than older people. Previously research has shown that mass practice can improve performance and increase expertise on a task (Fitts, & Posner, 1967; Gibson, 1969). To further explore expertise and text-speak processing we wanted to examine whether a relationship exists between the numbers of text messages sent per day and priming magnitude.

Norming

Method

Participants

One hundred University of Canterbury students (71 women and 29 men) participated in the study in exchange for course credit. All participants were native English speakers and native New Zealanders with a mean age of 20; SD = 5.14, and had normal or corrected to normal vision.

Materials

Word stimuli

A selection of 1,193 words was selected from the Chiarello, Shears, and Lund word norms (1999). These words were pure nouns, pure verbs, or noun verb combinations (e.g., watch). The mean letter count was 5.05 (range: 3-7). The stimuli were divided into four lists. Participants were randomly assigned 25 to each list.

Procedure

There were two parts to the norming task. First participants were shown correctly spelled words one at a time on a computer screen and asked to type shortened forms of the words that they would use when online and instant messaging, text-messaging, tweeting, blogging or emailing or to indicate if they would not shorten the word. Upon completion of the word task participants were requested to complete a free response task. Participants were asked to type text-speak representations that they used in their own messaging. The tasks were completed individually or in small groups in a quiet room. Before these tasks, participants were asked to read an overview of the tasks and requested to sign an informed consent. The norming task took approximately 30 mins to complete.

Results

Text-speak word representations were aggregated based on the shortening techniques employed by the participant and if that representation had the same grapheme or symbol configuration as other participants. For example, all participants who shortened the word, “accept” as “acpt” were aggregated together and those who shortened phrases in the free responses portion such as “talk to you later” as “ttyl” were aggregated together. For each word or phrase we provided its equivalent text-speak form and the percent of those who responded with that representation. Due to limited space, we have only included examples of stimuli used in this study[1].

Discussion

For the norming study, participants were presented with correctly spelled words and were instructed to create a text-speak version for each word. Participants were instructed to imagine they were online instant messaging, text-messaging, tweeting, blogging or emailing when creating their text-speak representations. Additionally, we also collected participants' free response text-speak representations. This study was successful in creating a normed stimuli set for text-speak word and phrase representations for studies involving native New Zealanders.

Experiment

As described in the introduction, the goals of the present experiment were to explore a specific form of text-speak (i.e., subsets) and determine if these text-speak items have lexical meaning and whether experience with text-speak mediates priming effects. Additionally, we also sought to determine whether grapheme feature overlap was driving the priming effects found in Head, Helton et al. (2011). Thus, to achieve these goals, we selected an abridged stimuli set from the norming study discussed above consisting of subsets that were created by removing 1 or 2 letters from correctly spelled words. With the abridged stimuli set, we further degraded feature overlap between prime and probe by presenting the target and probe in different cases and different font types.

Methods

Participants

Four hundred and sixteen New Zealand University students (300 females) participated in the experiment in exchange for course credit. All were native speakers of English with a mean age of 20; SD = 5.0, and had normal or corrected-to-normal vision.

Five participants were removed for not meeting language requirements.

Materials

An abridged stimulus set was selected from the norming study. In the experiment, a target word (**text**) could be preceded by a prime in the form of (1) an identical word (**TEXT**), (2) a non-word (**GRFP**), or (3) a subset (**TXT**). Subset primes had either 1 or 2 letters omitted (e.g., west-wst, rubbish-rubsh, respectively). Identity primes, non-word primes, and subset primes with 1 or 2 letters omitted were rotated throughout the font change manipulation such that each prime condition appeared in the different font or same font condition and each target word only appeared once per list. The font change condition was treated as a between-subjects factor. Thus, half of the participants were assigned to the condition where the prime was presented in Bell MT font and the target in Courier font, while the other half of participants had both prime and target presented in Courier font. Eight stimuli lists were created to counterbalance between conditions across participants. Each list consisted of 280 items with equal numbers of word and non-word probes and targets. Subset words with a mean percent normative response greater than 20% were selected to serve as the primes in the subset prime condition. Subset words had a mean letter count of 3.75 (range: 3-5) and a mean percent normative response of 25% (range: 4%-64%). The target words had a mean letter count of 5.25 (range: 3-6). Similarly to Head, Helton et al., 2011, we presented the prime in uppercase and the target probe in lower case. Additionally, to further discourage grapheme overlap; we included a font change manipulation as a between subject factor (see Figure 1). Half the participants were presented with primes and targets in Courier font while for the remainder primes were displayed in the Courier font and targets in Bell MT font. All stimuli were presented in size 18 black fonts. To determine participants' familiarity with the Bell MT font, a familiarity scale was constructed. Participants' response were made on a 7-point likert scale whereby 1 = "Not familiar" and 7 = "Very familiar". Overall familiarity with the Bell MT font was low (M = 2.9; SD = 1.4). Post-hoc analysis did not reveal any significant correlations with level of familiarity to font and behavioural results.

Procedure

Participants were tested individually or in groups within individual cubicles. Participants were seated 50 cm in front of 37.5 x 30 cm Philips 220SW LCD screens. Presentation of stimuli and recordings of accuracy and reaction time were completed on PC computers using E-prime Professional 2.0 (Schneider, Eschmann, & Zuccolotto, 2002). On each trial a forward mask of hash marks (######) was presented for 500 ms followed immediately by the prime (see Head, Helton et al., 2011; Perea, Dunabeitia, & Carreras, 2008; Perea, & Gomez, 2010 for similar procedures). The prime was presented in the same location as the hash marks and was presented in uppercase on the screen for 50 ms. Immediately after the prime a target probe was shown until a participant made a lexical decision response. Participants completed practice trials until they achieved at least 85% correct to proceed to the experimental trials. Responses were captured using a serial response mouse. Participants were instructed to make "word" responses (e.g. sweet) by using the index finger of their dominant hand to press the left button on a serial mouse and to indicate "non-word" targets (e.g. gsdge) by pressing the right button with the middle finger of the same hand (the mouse was rotated 180° for left handed participants). Participants were not informed of the masked prime. No participants reported being able to perceive the masked primes at the conclusion of the study. Upon finishing the experiment, participants completed a text-speak questionnaire that assessed demographics, frequency of text use, and text-speck experience (Head, Helton, et al., 2011). The experiment duration was approximately 20 mins.

Results

Reaction times greater than 1,500 ms and less than 250 ms (less than 1% of the data), and incorrect responses (less than 5% of the data) were excluded from the analysis. Due to violations in sphericity, Greenhouse-Geisser estimates of sphericity are reported for degrees of freedom.

Lexical decision times

Mean lexical decision times were calculated for each prime condition. There were no significant differences in the amount of facilitatory priming for subset items based on whether 1 or 2 letters were omitted; therefore, the data reported are collapsed over these variables. Correct "word" lexical decision times in the identity, subset and non-words prime conditions were analyzed using a mixed between-within subject analysis of variance with font change as the between subject factor. Prime type was significant, $F(1.9,778.9) = 494.09$, $p < .001$, $\eta^2 p = .54$. The between subject factor and interaction failed to reach significance ($p > .05$). An a priori pair-wise t-test further explored prime type differences between identity (M = 594; SD = 55.89), subset (M = 610; SD = 52.66), and non-word (M = 633; SD = 52.53) primes. The t-tests verified that identity primes produced significantly shorter target word lexical decisions than subset primes ($t(415) = 11.42$, $p < .001$, $d = .71$). Identity and subset primes produced significantly shorter target word lexical decisions than non-word primes, $t(415) = 38.06$, $p < .001$, $d = 3.74$, $t(415) = 22.61$, $p < .001$, $d = 2.22$, respectively.

Accuracy

Accuracy data mirrored reaction time results with both font type and 1 or 2 letters omitted; therefore, the data reported are collapsed over these variables. The resulting identity, subset, and non-words were analyzed using a mixed between-within subject analysis of variance with font change as the between subjects factor. Prime type was significant, $F(1.5, 633.3) = 50.16$, $p < .001$, $\eta^2 p = .11$. There was no main effect or interaction for the font change manipulation ($ps > .05$). An a priori pair-wise t-test was used to further explore prime type differences between identity (M = .92; SD = .08) and subset (M = .90; SD = .07) prime conditions. Target probes preceded by the identity condition were responded to more accurately than target probes preceded by the subset condition $t(415) = 5.37$, $p < .001$, $d = .52$. Identity and subset primes produced significantly improved accuracy relative to a non-word prime

(M = .89; SD =.08), $t(415)$ = 14.87, p < .001, d = 1.46, $t(415)$ = 3.42, p = .001, d = .34, respectively. The error analysis thus consistently mirrored the RT analysis (see Figure 3).

Correlation

To explore the influence of sex, age, and number of text messages sent a day we correlated each of these with a measure of priming performance of subset primes. For priming performance we calculated the difference in RT between target words preceded by identity and subset words to establish magnitude of priming for each participant (see Head, Helton et al. (2011) for similar procedure). Magnitude of priming was then separately correlated with sex, age, and number of text messages sent a day. Sex and age failed to correlate with priming magnitude (r = .06, r = .02, ps > .05, respectively); however, number of text messages sent a day did significantly correlate with priming magnitude (r = .11, p =.03).

General Discussion

In the current investigation, text-speak words and phrase representations were collected from native New Zealanders to create a normed stimuli list. A sample of subset words as selected from the normed stimuli list and used within a masked priming experiment. The masked priming experiment consisted of correctly spelled primes (identity), primes with either 1 or 2 letters omitted (subset) and non-word primes that preceded target probes. As expected, the identity prime condition produced greater accuracy and faster responses to target probes compared to subset and non-words primes. Moreover, subset primes produced greater accuracy and faster reaction times to target probes compared to non-word primes. In regards to sex and age, the text-speak questionnaire failed to show any significant correlation with these items and magnitude of priming. However, those who reported sending more text messages each day displayed greater subset priming effects.

The behavioural results mirrored the results found in Head, Helton et al. (2011). Identity primes produced faster and more accurate responses to target probes compared to subset and non-word primes. Additionally, subset primes produced faster and more accurate responses to target probes compared to non-word primes but not identity primes. Importantly, regardless of whether the prime and probe were presented in different fonts (feature overlap degrading), priming effects for each prime type were not altered. In other words, if participants were using feature matching as a subconscious strategy for their target probe responses, then priming effects should have been significantly diminished compared to the group that had the prime and probe in the same font. Based on the greater priming effects of subset primes compared to non-word primes, our results further corroborate that text-speak word representations do possess a level of lexical representation and are not dependent on feature matching at a subconscious level.

The subset prime results suggest that participants interpreted a subset as word-like which was evident from the greater priming effects of subset primes relative to non-word primes. However, subset words failed to have the same level of priming effects as the identity condition. This may in part be due to subset words not being automatically activated like their correctly spelled analogue. As found in Head, Russell, et al. (2011), participants responded more slowly and with a greater number of errors as a result of processing subset items. Interestingly, subset words' lack of automatic activation seems to be extended to the subconscious level of processing. Thus, even without conscious awareness, subset words are more difficult to process and may demand additional mental resources to process. However, given the experimental design it is difficult to make that conclusion. Future studies should include methodologies to further investigate this.

Conscious processing of stories presented in text-speak versus correctly spelled stories has been shown to exact a cognitive cost to the reader (Head, et al., 2012). The reader is not only presented with subset representations but also a host of other text-speak representations (e.g., Can you come over tonight please? **Cn u cm ova 2nite pls?**). This paradigm makes it difficult to infer whether subsets are meaningful when isolated from context. To address this predicament, the current study presented subset words subconsciously and isolated from context effects. Similarly as found in Head, Russell, et al. (2011) reaction time and error rate both increased as result of processing subset items compared to processing correctly spelled words. The results provide evidence that subset items are not treated as identically to words, but still have a degree of lexical representation

Although there was no relationship between age and sex with priming magnitude, there was a significant correlation between the number of self-reported text messages sent a day and priming magnitude for subset primes. This significant correlation supports the finding that more practice on a task can yield greater task performance (Fitts & Posner, 1967, Gibson, 1969). Individuals who reported higher numbers of text messages sent a day are likely to have had more practice reading and producing text-speak than individuals who reported lower frequency of text messaging a day. This result suggests that participants who text message often are likely to encounter text-speak more frequently and thus benefit more from a subset prime in a masked priming task, relative to individuals who text less.

A limitation should be noted in regards to the correlation. Because we wanted to systematically investigate the impact of subset items on priming effects we employed a high number of normed subset word representations (N = 280). Although this approach provides more control of the word stimuli, it may not encompass many of the text-speak items that participants use frequently. In other words, we may have forced upon the participant subset words that they do not commonly use in their repertoire. This may explain the small correlation between priming magnitude and number of text messages sent a day. Additionally, the focus of this study was subset words, future studies should examine other forms of text-speak (e.g., shortcuts, phonetic respellings and numerals) in a masked priming experiment to determine whether those word representations posses semantic meaning.

Collectively, the results support

the idea that a specific form of text-speak (i.e., subset) does posses a level of lexical representation and does not require sentence context for activation. The current study was able to show that feature overlap was not driving the priming effects found previously in Head, et al. (2011). As the use of text based communication increases within civilian and military occupations, so does the likelihood of text-speak appearing. Thus, future investigations may want to examine whether using standardized shortening techniques for words or phrases may further reduce the chances of misinterpretation of a message.

Footnote

[1]We have provided other subset word forms and free responses (e.g., phonetic respellings, shortcuts, acronyms, nonconventional spellings, emoticons, and numerals) not reported in this paper online for downloading: (https://docs.google.com/file/d / 0juLcc2QNN4WkNUNVU2dW4xRjA/edit).

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APPENDIX A

Stimuli and Item Data

Prime	Target	%	RT(SD)
BLSS	bless	56	589(205)
BNE	bone	28	566(158)
DCT	duct	12	702(243)
DFY	defy	20	706(230)
ENGLF	engulf	36	833(373)
OPPSE	oppose	52	613(138)
PD	pad	12	654(203)
PSTER	pester	16	733(260)
RB	rob	12	625(152)
RDEO	rodeo	16	655(231)
RIGR	rigor	32	732(261)
RIPN	ripen	36	738(272)
RLE	role	4	596(181)
RMPLE	rumple	24	734(402)
RNG	ring	56	543(159)
RNK	rink	36	705(313)
ROBT	robot	24	564(140)
RTATE	rotate	16	597(135)
SALD	salad	12	564(160)
SALN	salon	16	623(415)
SALRY	salary	16	600(163)
SAR	sear	4	662(206)
SATRE	satire	4	732(277)
SAUCR	saucer	20	622(274)
SBDUE	subdue	16	771(208)
SCFF	scoff	40	722(225)
SCLD	scold	52	648(265)
SCNE	scene	12	571(162)
SCOP	scoop	16	585(198)
SCRCH	scorch	24	739(355)
SCOT	scoot	4	645(234)
SDA	soda	24	602(156)
SE	sea	4	601(187)
SEIZ	seize	16	657(222)
SERCH	search	40	564(197)
SETTL	settle	20	603(180)
SEVR	sever	40	727(323)
SEWAG	sewage	20	687(231)
SHCK	shock	32	633(310)
SHLF	shelf	56	646(155)

APPENDIX A

(Continued)

Prime	Target	%	RT(SD)
SHN	shun	8	862(261)
SHRD	shred	40	649(231)
SHRK	shirk	36	655(261)
SHRMP	shrimp	52	626(209)
SKD	skid	36	664(194)
SKM	skim	32	627(197)
SKT	skit	32	694(244)
SLDGE	sludge	28	723(338)
SLG	slug	16	672(238)
SLOCH	slouch	4	635(191)
SLVE	solve	36	629(184)
SMMER	simmer	40	674(254)
SND	send	76	553(116)
SNFF	sniff	60	677(308)
SNG	song	76	546(152)
SNRE	snare	24	623(175)
SNTRY	sentry	48	675(236)
SOCCR	soccer	36	551(123)
SOL	soul	28	613(146)
SONR	sonar	20	785(280)
SOR	soar	32	641(190)
SPCK	speck	28	770(293)
SPHER	sphere	20	650(198)
SPKE	spike	20	598(258)
SPLL	spell	60	551(121)
SPNGE	sponge	48	587(276)
SPRN	spurn	40	799(332)
SQUSH	squash	20	583(264)
ST	sit	4	640(137)
STCK	stack	28	610(175)
STDIO	studio	20	579(172)
STRDE	stride	20	623(260)
STRVE	strive	24	612(202)
STTUS	status	8	603(168)
SUBMT	submit	24	583(172)
SUBRB	suburb	44	643(172)
SUFFR	suffer	24	600(155)
SVE	save	64	614(189)
SWPE	swipe	24	620(171)
SWRD	sword	36	589(208)

APPENDIX A
(Continued)

Prime	Target	%	RT(SD)
SYRP	syrup	32	644(279)
TANT	taint	12	652(192)
TATTR	tatter	32	733(324)
TCK	tack	4	609(182)
TE	tea	60	563(124)
TECH	teach	32	559(134)
TEETR	teeter	24	807(474)
TEL	tell	64	579(113)
TEM	teem	16	694(409)
TENNT	tenant	36	645(180)
THD	thud	28	718(234)
THGH	thigh	36	582(126)
THME	theme	28	628(227)
THRB	throb	36	646(175)
THRFT	thrift	44	672(294)
TLENT	talent	44	553(101)
TMPO	tempo	36	651(272)
TND	tend	32	557(130)
TNDON	tendon	40	613(244)
TOWR	tower	32	556(111)
TRAT	trait	28	616(159)
TRBE	tribe	20	625(351)
TRDGE	trudge	28	677(225)
TRED	tread	16	626(251)
TRETY	treaty	20	632(370)
TRF	turf	28	683(164)
TRKEY	turkey	20	612(230)
TRPHY	trophy	36	597(174)
TUCH	touch	16	571(209)
TUMR	tumor	28	680(218)
TWN	town	84	613(191)
TYRNT	tyrant	60	688(251)
ULCR	ulcer	12	697(172)
UNFY	unify	8	670(320)
UNT	unit	16	573(134)
UNTE	unite	4	622(173)
VANSH	vanish	24	586(178)
VLUME	volume	32	594(287)
VNE	vine	32	588(202)
VRB	verb	80	584(144)

APPENDIX A
(Continued)

Prime	Target	%	RT(SD)
VSE	vase	20	622(136)
VTE	vote	4	585(186)
VYAGE	voyage	12	637(200)
WAL	wail	4	734(303)
WANDR	wander	28	708(792)
WDE	wade	8	780(466)
WEGH	weigh	16	612(187)
WELTH	wealth	24	602(211)
WGON	wagon	32	604(191)
WNCE	wince	36	708(372)
WRETH	wreath	20	642(224)
WRK	work	80	605(172)
WRNG	wring	20	743(289)
WRT	wart	20	707(217)
WRTE	write	52	585(150)
WHTE	white	4	702(243)
WSP	wasp	32	630(141)
YLP	yelp	32	712(590)
YUTH	youth	36	558(148)
ZP	zip	4	624(169)
ADHR	adhere	16	750(364)
AGR	agree	24	585(181)
ALLD	allude	52	786(343)
ARG	argue	32	592(150)
AROS	arouse	8	605(168)
ASSM	assume	36	591(152)
AVNG	avenge	36	688(329)
BBLE	bauble	16	771(258)
BCKT	bucket	24	582(115)
BGL	bugle	16	758(235)
BLNG	belong	28	570(151)
BND	bound	20	604(164)
BNNA	banana	24	564(117)
BRD	bride	32	565(113)
BRLY	barley	24	606(151)
BST	beast	4	589(168)
bk	book	4	588(196)
BSTL	bustle	16	645(280)
BTLR	butler	16	657(204)
BTN	baton	20	723(271)

APPENDIX A
(Continued)

Prime	Target	%	RT(SD)
BWAR	beware	36	583(142)
CHM	chime	24	716(256)
CHR	choir	4	611(970)
CHSE	choose	16	581(186)
CLMN	column	48	719(271)
CLSE	clause	12	724(241)
CNCR	cancer	20	575(113)
CNTY	county	8	632(216)
CRK	creek	20	625(201)
CRK	croak	8	699(207)
CVRT	cavort	8	898(374)
CWRD	coward	36	651(208)
CX	coax	4	837(292)
DDCE	deduce	32	678(238)
DETN	detain	40	658(237)
DFFR	differ	32	631(201)
DFND	defend	40	569(172)
DLDE	delude	16	736(328)
DLTE	dilate	12	703(329)
DMN	demon	20	575(128)
DRM	drama	40	607(182)
DRN	drain	16	604(159)
DSGN	design	28	542(141)
DSTL	distil	16	801(365)
DTCH	detach	32	720(259)
DTCT	detect	32	597(167)
DVOT	devote	48	602(197)
DVRT	divert	28	656(315)
DZ	daze	12	662(196)
ENBL	enable	28	599(148)
ENJ	enjoy	28	543(111)
EQP	equip	16	628(148)
ERD	erode	20	683(220)
EXCD	exceed	36	588(125)
FBR	fiber	32	671(234)
FL	fail	4	601(220)
FLCN	falcon	32	620(191)
FLNT	flaunt	24	715(223)
FNDR	fender	24	671(293)
FRD	fraud	16	675(233)

APPENDIX A
(Continued)

Prime	Target	%	RT(SD)
FRGT	forget	40	563(207)
FT	feat	28	670(344)
FUSN	fusion	8	622(304)
FVR	favor	16	624(277)
GATY	gaiety	12	906(492)
GGE	gouge	8	751(232)
GLLN	gallon	52	672(270)
GLLP	gallop	48	632(196)
GLNC	glance	40	576(152)
GLT	guilt	16	612(166)
GLZ	glaze	32	606(151)
GRD	greed	12	596(138)
GRP	grape	36	610(258)
GRT	greet	8	607(271)
GRVL	grovel	28	652(223)
GUTR	guitar	36	566(108)
GVRN	govern	32	640(223)
HLTH	health	40	527(114)
HNDR	hinder	24	654(284)
HNUR	honour	28	603(164)
HP	hope	64	617(260)
HRSS	harass	44	742(316)
HVN	haven	28	676(248)
IMPR	impair	12	626(24)
INJR	injure	32	666(411)
KDNP	kidnap	24	641(160)
LK	leak	8	620(152)
LNGE	lounge	12	569(156)
LRN	learn	40	556(151)
LSSN	lesson	20	575(202)
LTON	lotion	12	620(147)
MD	mood	8	606(203)
MDFY	modify	20	617(183)
METR	meteor	8	756(343)
MFFL	muffle	28	675(202)
MLDY	melody	12	596(156)
MNC	mince	48	591(168)
MNGE	manage	20	643(193)
MNGL	mingle	16	645(247)
MNR	manor	20	663(224)

APPENDIX A
(Continued)

Prime	Target	%	RT(SD)
MPRT	impart	32	688(329)
MRGR	merger	24	691(214)
MRN	mourn	36	677(206)
MRSL	morsel	32	676(238)
MRVL	marvel	4	613(150)
MSRY	misery	52	589(141)
MT	meat	4	569(141)
MTHD	method	44	557(137)
NCTR	nectar	28	637(150)
nd	need	4	643(204)
NFR	infer	28	778(313)
NFST	infest	40	609(143)
NT	note	40	560(130)
NTR	enter	48	555(181)
NVRT	invert	40	645(182)
OMLTE	omelette	44	672(210)
PCFY	pacify	8	690(280)
PCH	poach	20	631(184)
PIGN	pigeon	16	593(113)
PLCY	policy	4	588(248)
PLLY	pulley	24	772(299)
PLZ	plaza	28	702(190)
PRCE	pierce	4	685(293)
PRDN	pardon	28	598(163)
PRSN	person	40	540(117)
PRYR	prayer	24	597(162)
PST	paste	48	606(231)
QTA	quota	8	747(313)
RCT	react	4	585(120)
RCTE	recite	12	645(150)
RD	read	28	585(196)
REGN	regain	16	665(422)
RF	reef	8	616(140)
RFNE	refine	16	639(140)
RGN	organ	76	640(249)
REN	reign	12	628(212)
RL	reel	8	681(240)
RVNE	ravine	20	771(250)
STK	steak	20	645(381)
XTND	extend	40	628(287)

Note. One and two letter omitted primes are alphabetically listed under the prime column. The target column contains correctly spelled target probes for the “yes” response in the lexical decision. The “%” column includes the percentage of those who responded with the same shorting technique. The RT (reaction time) column includes the average correct response time and standard deviation in parenthesis to a target probe preceded by the subset prime.