ASCII Affect:

A comparison of emoticons and facial expressions in affective priming

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Abstract

The effects of emoticons in textual computer-mediated communication (CMC) remain relatively unexplored. CMC researchers have suggested that emoticons behave much as do facial expressions in face-to-face interaction (e.g. Danet, Ruedenberg-Wright, & Rosenbaum-Tamari, 1997; Rezabek & Cochenour, 1998; Thompson & Foulger, 1996). Some fMRI research suggests, however, that there is not a direct neural correspondence between emoticons and facial expressions, but that emoticons play an important role in determining the positive or negative valence of an utterance (Yuasa, Saito, & Mukawa, 2011). Following the affective priming paradigm developed by Fazio, Sanbonmatsu, Powell, and Kardes (1986), this study explores the priming effects of emoticons vis-à-vis photographs of facial expression and emotional words on valence judgements of emotionally charged words. Significant main effects of age, prime valence, and target valence were found. There were also significant interactions between these three factors. Overall results suggest that younger and older participants have differing experiences of emoticons, with younger participants experiencing an effect of emoticons that is similar to the effect of facial expressions while older adults seem to experience emoticons in ways more like textual information or even just textual nonsense.

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1. Introduction

In an increasingly digital world, ever more social interaction is taking place online. Between Facebook, Twitter, instant messaging (IM), email, and a plethora of other social networking tools, more and more of our social lives are being channelled through devices. Many researchers have investigated the consequences of this shift towards using CMC, from users' choice of communication medium (e.g. Riordan & Kreuz, 2010), to its impact on the academic performance of youth (e.g. Drouin & Davis, 2009; Plester, Wood, & Joshi, 2009), its functional implications within corporations (e.g. Luor, Wu, Lu, & Tao. 2010; O'Kane & Hargie, 2006), and even impacts on gender expression and relations (e.g. Baron, 2004; Kapidzic & Herring, 2011). Though many studies touch on emoticons (e.g. Baron, 2004; Riordan & Kreuz, 2010), few thoroughly explore and explain their role and nature. In this study, the degree of functional similarity between American Standard Code for Information Exchange (ASCII) emoticons and facial expressions was explored through priming, in order to better understand how emoticons affect our judgements of valence in computer mediated communication (CMC).

In section 2, a selection of existing literature on studies of emoticons and affective priming is presented. Following the literature review, in section 3, the questions and corresponding hypotheses driving this research are laid out. Section 4 describes the methodology while the results are found in section 5. Moving into section 6, the results and their implications and limitations are discussed. Section 7 presents the conclusion.

2. Literature Review

2.1. Assumed Emotion

It seems to be common practice to assume that emoticons are, as their name suggests, “emotional icons”. Researchers state that emoticons are “visual cues formed from ordinary typographical symbols that when read sideways represent feelings or emotions” (Rezabek & Cochenour, 1998, p. 201), or “icons for the expression of emotion” (Danet, Ruedenberg-Wright, & Rosenbaum-Tamari, 1997, n.p.) and that they are used “as surrogates for nonverbal communication” (Thompson & Foulger, 1996, p. 226). A few, however, have sought to investigate the potential illocutionary and verbal role of emoticons. In the following section we explore their findings.

After a detailed study of emoticon distribution in IM, Garrison, Remley, Thomas, and Wierszewski (2011) conclude that emoticons are conventionalized paralinguistic markers in CMC. They argue that emoticons are independent semiotic units that neither compensate for lack of visual cues, nor act as supplementary icons to the message’s text, instead they indicate meaning as would a non-emoticon symbol such as a checkmark. Though Garrison et al. (2011) do not draw conclusions as to the ultimate relationship between emoticons and facial expression, the notion of emoticons as independent units of meaning, which may occur with or without linguistic information and which play important communicative and expressive roles, is strikingly similar to the role of facial expression in face-to-face (FTF) communication (Buck, 1994).

Taking a somewhat different tack, Lo (2008) suggests that emoticons are "quasi-nonverbal cues" (p. 595), because, though they help convey valence or emotional cues, they are also typed deliberately and therefore have the intentionality of verbal information. Authors such as Lo (2008) and Walther and D'Addario (2001) claim that emoticons are unlike facial expression insofar as they are voluntary and actively presented, but facial expression can also be voluntarily produced to achieve a communicative rather than an emotionally expressive goal (e.g. smiling when encountering an annoying acquaintance to fulfil social expectations). Thus, it seems that intentionality is insufficient for distinguishing emoticons and facial expression or other nonverbal cues.

Finally, Dresner and Herring (2010) use Speech Act Theory to frame emoticons as indicators of illocutionary force rather than solely emotional content. The authors suggest that emoticons appear in places where the corresponding facial expression would not, even if said facial expressions were voluntary. Such an argument, though potentially persuasive, lacks empirical proof and is questioned by the researchers' own findings that subjects may smile to lighten an otherwise heavy statement as found in online discussions of struggles with fibromyalgia. Moreover, despite their efforts to distance emoticons from "emotional icons", Dresner and Herring (2010) concede that at least some portion of the role of emoticons in CMC is that of indicating emotion and standing in for facial expression.

On the basis of prevailing opinion and the concessions of dissenters, it seems reasonable to assume that emoticons are at least sometimes representations of emotional facial expression. However, this is not tantamount to evidence that emoticons *act* as facial expressions. Researchers have tackled this problem in several ways: by observing the distribution of emoticons in use in experimentally elicited writing samples or naturally occurring data, by testing perceptual reaction to emoticons in experimental stimuli, and by observing subjects' brain activity while viewing emoticons and text.

2.2. Emoticons in Use

Investigation of naturally occurring data consistently finds three major trends of emoticon distribution: emoticons do not occur as often as the popular media implies, women use more emoticons than men, and the most frequently used emoticon is the smiley :), closely followed by other positive or "joke-y" emoticons such as :P, ;), and :D. Though not straightforwardly related to the emoticon's role as an ASCII facial expression, these trends are sufficiently established to warrant discussion.

Within a corpus of 11, 718 words drawn from the IMs of college students and recent college graduates, Baron (2004) found only 49 emoticons (0.004% of total). Similarly, Garrison et al. (2011) found only 301 emoticons in a corpus amounting to a total of 32,000 words (0.009% of total) drawn from the IMs of college students. Tossell, Kortum, Shepard, Barg-Walkow, Rahmati, and Zhong's (2012) study of naturally occurring text messages from college students found that only 4.24% of 158,098 messages contained emoticons. Such paucity of emoticons seems to call into question their role as facial expressions as FTF conversation is paired with frequent facial expressions. Positive or so-called neutral facial expressions were present an average of 62.16% of the time in conversations between the adolescents studied by Turkstra, Ciccia, and Seaton (2003). Since emoticons are volitionally produced, however, it is possible that they are limited to expressing only those facial expressions that are also voluntarily displayed. Just as Reisenzein, Bördgen, Holtbernd, and Matz (2006) found that only 4-25% of participants displayed facial indicators of surprise despite indicating that they felt surprise during the experiment, users of emoticons may choose to withhold a visual expression of their feeling. Reisenzein et al. (2006) also found that no participants displayed the full three part "surprise" expression and so, given that emoticons tend to be exaggerated and categorical, their use may be similarly limited. Whereas facial expressions are socio-culturally conditioned (Russell, 1994) and develop prior to language production (Fogel & Thelen, 1987; Steiner, 1979), emoticons remain a comparatively new phenomenon developed on message boards in the early 1980's (Raymond, 1994); their use in all cases follows literacy. Thus, unlike facial expression, which is innate, even if sometimes chosen, and well established in human cultures, emoticons, and CMC in general, are fairly recently learned skills which continue to undergo "domestication" (Baron, 2007, p. 4), the process by which a new technology becomes an accepted part of everyday life.

In spite of the generally low frequency of emoticons found in CMC, studies have also found that women (or users that appear to be women) generally use more emoticons than their male counterparts. Baron (2004) found a distinct difference between male and female emoticon use: three quarters of female participants used emoticons while only one sixth of male participants used them. Wolf (2000) also found that women used more emoticons in all-female USENET newsgroups than did men in all-male newsgroups. Interestingly, however, in mixed gender groups, male use increased such that the difference in emoticon use was not statistically significant. Wolf (2000, p. 832-833) links this difference in use to women's extension of emoticon use for purposes of solidarity, support, assertion of positive feelings, and thanks. In FTF self-disclosing and supportive interactions, people tend to use more supportive and empathetic facial expression and so emoticons may simply be playing the corresponding supportive role in women's CMC. This phenomenon may also be related women's tendency to be more emotionally expressive (Buck, Savin, Miller, & Caul, 1972). Therefore, despite the paucity of emoticons overall, women's increased emoticon use may be a direct translation from increased use of emotive facial expression.

Numerous studies have also found that the regular smiley, :), is the most commonly used emoticon (e.g. Baron, 2004; Wolf, 2000; Garrison et al., 2011; Rezabek & Cochenour, 1998). A potential explanation for this tendency is suggested by the findings of Walther and D'Addario (2001). In looking at perceptions of emails with embedded emoticons, Walther and D'Addario (2001) found that any negative element, whether verbal or symbolic, caused the entire utterance to be interpreted as negative regardless of the valence of the other component. It seems that negative items have sufficient power to control an entire utterance's valence. Following the Gricean Cooperative Principle (Grice, 1975), communication is a cooperative enterprise and so, strongly negative expressions are less favourable than positive or cooperative ones. As such, negative emoticons may turn up less frequently than positive ones, given the aim of perpetuating cooperative communication through softening and other cooperative actions rather than through negativity. Similarly, negative facial expressions tend to be used at far lower frequencies than positive or neutral facial expressions, especially among adolescents (Readdick & Mullis, 1997, Turkstra et al., 2003).

Following these general trends, it appears that emoticons may, for their producers, act in much the same way as volitional, facial expressions – especially those that have an impact upon the interpretation of the message. Nonetheless, understanding of emoticons is still emergent and an account of CMC users' actual motivations for emoticon use is lacking. Entering into finer analyses and more emoticon specific research, studies have also found a variety of trends in distribution and motivations for use (e.g. Derks, Bos, and Grumbkow, 2004; Provine, Spencer, and Mandell, 2007).

Studying naturally occurring emoticons on Internet message boards, Provine et al. (2007) found that emoticons, like laughter in FTF, tend to punctuate strings of text. They occur almost categorically at utterance or phrase boundaries, unable to interrupt verbal information, suggesting that they are, like laughter, produced by a separate system competing with the linguistic system, and coordinated linguistically rather than simply by allocation of motor systems (Provine et al., 2007, p. 300). If emoticons are distributed so similarly to laughter, and laughter is a paralinguistic (and therefore non-verbal) act, then it seems logical to hypothesize that emoticons are also paralinguistic acts and therefore may be assumed to carry non-verbal information just like laughter and facial expression.

Beyond punctuation, emoticons also seem to function in improving the user experience by enhancing feelings of solidarity and enjoyment. Huang, Yen, and Zhang's (2008) survey of college students indicated that use of emoticons had a generally positive effect on communication, increasing the user's "enjoyment, personal interaction, perceived information richness, and perceived usefulness" (p. 466). Rivera, Cooke, and Bauhs (1996) found that emoticon users were generally more satisfied with an experimental CMC system than were non-users. These effects are not dissimilar to those that are generally associated with use of facial expressions. Facial expressions facilitate communication through the sharing of emotions and the creation of shared intentionality which allows the receiver to have a concept of their interlocutor's mind (Tomasello, Carpenter, Call, Behne, & Moll, 2005).

Emoticons appear to pattern like facial expression in varying socio-emotional contexts. Derks et al. (2004) found that subjects in an experimental setting used more emoticons in social versus task-oriented conditions. They argue that this is analogous to emotional expression as it is "more appropriate to show one's emotions and feelings towards friends than towards colleagues" (p. 846). In further work, Derks, Bos, and Grumbkow (2008b) found that subjects, asked to respond to simulated Internet chats from either a "friend" or a "stranger", tended to use more emoticons with friends than with strangers. Emoticon use was also more frequent in positive contexts than it was in negative ones. Again, this suggests that CMC participants follow similar norms of emotional disclosure as is done in FTF interaction—sharing more facial expression/emoticons with friends than with colleagues (Wagner & Lee, 1999), and preferring positive expressions (Readdick & Mullis, 1997).

Derks et al. (2008b) also surveyed participants' motivations for emoticon use. They found that "emoticons are mostly used to express emotion, to strengthen a message, and to express humor" (p. 99). This notion of emoticons as expressing emotion is analogous to the use of facial expression, as confirmed in previous research (e.g. Eckman, Davidson, & Friesen, 1990; Winkielman & Cacioppo 2001), to convey affective responses. Similarly, facial expressions, like emoticons, may be used to enhance message valence strength and to indicate a joke. Thus, in experimental investigations of use, emoticons seem to pattern in similar ways to facial emotional expression, and users seem to conceive of their emoticon use as quite similar to their use of facial expression.

2.3. Perception of Emoticons

Use alone is half of the emoticon equation. In order for emoticons to be classified as CMC facial expressions they must cause similar perceptual responses in recipients of a message. However, there is little research done in this field and there is much disagreement between those who have explored it.

As discussed above, Walther and D'Addario (2001) used email messages with embedded valence sentences with or without one of the following emoticons: :), ;), and :(. They found that messages with any negative component (whether text or emoticon) were rated negatively; otherwise emoticons were found to have little to no effect on message interpretation. Walther and D'Addario (2001) argued that this counters the notion of emoticons as analogous to facial expression as, in FTF, non-verbal cues—especially facial cues—carry greater weight than does verbal information. However, Walther and D'Addario (2001) made use of verbal stimuli which carried very strong valences. As such, the results of the study may warrant scepticism as the sentences may have been too extreme to be affected by any one paralinguistic cue, whether it be a facial expression or an emoticon. Supporting this suggestion is the fact that later studies (e.g. Lo, 2008; Derks, Bos, & Grumbkow, 2008) have found that emoticons do in fact affect the perceived valence of accompanying text when the text is less absolute in valence.

Lo (2008), for example, focussed on emotionally neutral or ambiguous text and found that, where readers could not infer the attitude of the writer from text alone, the addition of an emoticon significantly coloured their perceptions. Therefore, even if emoticons cannot change the interpretation of strongly valenced statements as suggested by Walther and D'Addario (2001), they are useful in ambiguous contexts. They may, in fact, compensate for the lack of paralinguistic information, such as vocal tone or facial expression, in circumstances where the verbal information itself does not provide clear intent.

Modeled on the work of Walther and D'Addario (2001), Derks et al. (2008) also added a neutral text condition to explore the role of emoticons outside of strongly valenced contexts. Though emoticons could not invert the valence of a verbal message, they intensified verbal content of the same valence. In mixed message conditions, though no inversion occurred, as would be expected if emoticons behaved exactly as non-verbal cues in FTF, the messages were rated as significantly more ambiguous than messages either lacking an emoticon or with an agreeing emoticon. Derks et al. (2008) concluded that "emoticons can serve as nonverbal surrogates for facial behavior and do have an impact on message interpretation" (p. 386). Although emoticons may not be as powerful as FTF non-verbal communication, considering the results of Derks et al. (2008), they do seem to fulfill the same purposes (if to a somewhat lesser degree).

Guided by the methodology and discoveries of both Walther and D'Addario (2001) and Derks et al. (2008), Luor et al. (2010) investigated the role of emoticons in simplex (e.g. scheduling a meeting) and complex (e.g. discussions or requests for discussions) task-oriented workplace communications. Only neutral verbal messages were used. Walther and D'Addario's (2001) negativity effect was supported by the finding that negative emoticons triggered negative evaluations of both simplex and complex tasks. Positive emoticons were also found to create positive affect in complex tasks for both genders, but only for women in simplex tasks. This may be supported by women's greater use of emoticons (Wolf, 2000), potentially making them more receptive to the effects of emoticons sent by others. Ultimately, Luor et al. (2010) claimed that emoticons are communicative and may improve interpersonal relationships, rather like facial expression and other forms of non-verbal behaviour.

In summary, all but one survey of emoticon perception have found that emoticons do impact message interpretation, typically in ways similar to facial expressions in FTF communication. These studies have primarily investigated the perceptions and behaviours of university undergraduate students and have not explored the role of emoticons amongst other demographic groups (i.e. older adults). There have also yet to be naturalistic studies of emoticon reception, but these simulated experimental conditions focussing on youth offer tantalizing suggestions that emoticons are interpreted in valenced ways and may be filling the gap left by absent paralinguistic information in CMC.

2.4. Emoticons in the Brain

Stepping away from the self-reporting and survey paradigms seen in the previous work on emoticon perception, Yuasa, Saito, and Mukawa (2011b) make use of brain imaging to explore the connection between emoticons and facial expression. Yuasa et al. (2011b) used fMRI to measure the neural activity of subjects while reading sentences with emoticons at the end.[1] These sentences lead to activation of subjects' right inferior frontal gyrus, a region associated with emotion discrimination tasks. The right fusiform

[1] The study was conducted with Japanese emoticons, which focus on eye rather than mouth shape, and therefore may not be generalizable to Western emoticons. Nonetheless, it remains important to note that emoticons activate the region responsible for emotional discrimination, but not the one solely activated by linguistics stimulus.

gyrus, which is activated by seeing faces, was not activated, suggesting that emoticons are not perceived as faces. In addition, the posterior cingulate gyrus, which is used in discrimination of emotional words, was not lit up. It thus seems that emoticons are an emotional indicator independent from faces and emotional words. Therefore, in spite of the reduced detail and realism responsible for activating the right fusiform gyrus in viewing faces, emoticons may still act as faces in triggering assessments of emotional valence.

Further work by, Saito, and Mukawa (2011a) found that graphic emoticons (upright line drawings of major facial features in the constellations of a particular emotion), which carry more facial detail than ASCII emoticons, triggered not only the right interior frontal gyrus but also the right fusiform gyrus, though not to the same extent as a photograph of a face. Thus, it can be suggested that emoticons, cartoon images of faces, and photos of faces sit along a continuum of activation for the right fusiform gyrus in order of detail and realism.

This neuropsychological data, combined with the conclusions drawn from the linguistic research above, strongly suggests that emoticons are perceived in ways very similar to facial expression in so far as they contribute to emotional valence judgements and trigger corresponding neural activations. Thus, they ought to behave in ways similar to facial expressions in priming experiments.

2.5. Affective priming

First developed by Fazio, Sanbonmatsu, Powell, and Kardes (1986) to explore the affective nature of attitude objects through priming, the affective priming paradigm has since been used in a wide variety of research contexts, the most relevant to the current question being the use of emotive facial expression to prime word valence judgements (e.g. Aguado Garcia-Gutierrez, Castaneda, & Saugar, 2007; Andrews, Lipp, Mallan, & Konig, 2011; Zhang, Li, Gold, & Jiang, 2010). In this paradigm, a photograph or composite image of a positive or negative facial expression (the prime) is displayed either above level of consciousness, such that the participant is aware of the image, or below the level of consciousness, in which case the participant sees the image so briefly that it does not enter their conscious awareness. A word with either positive or negative valence (the target) is then displayed and the participant is asked, as quickly as possible, to press one of two buttons to categorize the word as negative or positive.

There is some debate as to the relative power of masked (below the level of consciousness) and unmasked (above the level of consciousness) priming. For example, Murphy and Zajonc (1993), using facial expression primes and Chinese character targets, found that priming only occurred in conditions where the facial expression was not consciously seen. In contrast, Andrews et al. (2011), and Hsu, Hetrick, and Pessoa (2008) both found that increased conscious visibility of a prime improved priming effects and that primes of low-to-no visibility did not exhibit priming effects. Andrews et al. (2011) argued that the difference in visibility was best manipulated by masking. This is contradicted by Hsu et al.'s (2008) findings that priming effects still occur in masked primes, but the duration of the prime display must be increased from 33ms, to 90ms. Many researchers (e.g. Aguado et al., 2007; Spruyt, Hermans, De Houwer, & Eelen, 2002) have elected to use an unmasked prime with a short blank display between the prime and the target. This method presents a compromise between masked priming and unmasked priming—there is no distractor image as in masked priming, and yet there is still some lag time between seeing the prime and the stimulus.

Another discovery in affective priming was made in Spruyt et al.'s (2002) investigation of priming modalities, where they found that pictures are significantly more effective primes than words, regardless of whether the target itself is a word or a picture. This suggests that if emoticons are perceived as verbal information, like words, they will be significantly less effective primes than facial expressions and will behave more like words. In contrast, if emoticons are, as suggested through existing research, a form of non-verbal information, they should behave much more similarly to photographs of facial expressions than to words.

3. Research Questions & Hypotheses

The existent literature on emoticons suggests that if emoticons act as textual facial expressions, they should successfully prime words of the same affective valence to a greater degree than do words. Thus, for this research, the effects of emoticons, emotional words, and emotional facial expressions on valence judgements of positive or negative words are compared. The responses of both a younger and older demographic are investigated. Considering the findings of Walther and D'Addario (2001), Derks et al. (2008), and Luor et al. (2010), that emoticons, unlike facial expressions, were unable to reverse the valence of a strongly positive or negative verbal message, it is reasonable to hypothesize that emoticons have less affective power than facial expressions. Combined with the work of Yuasa et al. (2011a) that finds more detailed graphic emoticons create neural activation more analogous to that created by faces, it is reasonable to suggest that the simplification of features in emoticons may drive their reduced affective influence. Thus, a reduced priming effect, vis-à-vis faces, is expected.

H1: Emoticons will prime words of a congruent affective valence more strongly than words will (but they will likely do so somewhat less strongly than do facial expressions).

Donges et al.'s (2012) finding that women perceive positive facial expression more easily than negative facial expression may also interact with the finding that the positive emoticon :) is the most commonly used emoticon (e.g. Garrison et al., 2011; Rezabek & Cochenour, 1998; Wolf, 2000). If there is a preference for use and perception of positive emoticons, then this, combined with greater exposure, suggests that positive emoticons will show a stronger priming effect than do negative ones. Nonetheless, Walther and D'Addario's (2001) negativity effect (confirmed by Luor et al. 2010) predicts than any negative element (emoticon or text) in an utterance renders the perception of the entire utterance as negative. This suggests that, at least in incongruent pairs, a negative emoticon will show a stronger interference effect than a positive emoticon will.

H2: Negative and positive emoticons will show different strengths of priming effect.

Finally, exposure effects must be taken into account. Since emoticons were developed fairly recently, in the 1980s, it is likely that older users are neither as comfortable nor as familiar with the symbols as are younger users. Thus, older or less frequent users may not associate the same degree of emotive power with emoticons as with real world facial expressions. As a result, these users will be expected to experience a lesser degree of priming from emoticons than from faces.

H3: Older users will not respond as strongly to emoticon primes.

4. Methodology

Working within the Affective Priming paradigm established by Fazio et al. (1986), this study adopts the priming procedure of Aguado et al. (2007) to explore a three-way contrast between prime-type within a two-way contrast in age. This study has four independent variables (prime type, prime valence, target valence, and age of participant). In the model of Aguado et al. (2007), driven by the salience of congruence in priming paradigms, prime valence and target valence can be reanalyzed as a single variable, congruence, which parcels valences as congruent (positive/positive and negative/negative) or incongruent (positive/negative and negative/positive). Thus, the variables can be represented by the following three-way interaction: 2x3x2 (age: 18-25 or 45-65, prime type: emoticon, photograph of facial expression, or word, and congruence: prime and target of same valence, or prime and target of opposite valence).

4.1. Participants

The literature suggests that women use more emoticons than men (e.g. Baron, 2004; Tossell et al., 2012; Wolf, 2000) and that they use them for different purposes (Wolf, 2000) and in different ways (Tossell et al., 2010) than do men. Furthermore, Donges, Kersting, and Suslow (2012) have found that women perceive positive emotion more easily than do men in affective priming paradigms. Thus, given these gendered behaviours, only female participants were selected to remove the confounding variable of gender from the equation.

In order to explore the effects of age/exposure on emoticon priming effects, 20 female participants were recruited: ten from the 18-25 age range and ten from the 45-60 age range. These age groups were selected to ensure an adequate difference in age of exposure to emoticons and in the likelihood of regular use. Because emoticons were first developed in 1982, women over the age of 45 were already past the socially powerful stage of adolescence (wherein there is increased pressure to establish oneself as belonging to a peer group distinct from both adults and children (Eckert, 2003)) when emoticons evolved, and most likely were entirely through adolescence before they began using emoticons. Thus, they were less vulnerable to the introduction of the new form. In contrast, members of the younger cohort were all born at least 6 years after the emoticon and likely grew up exposed to and using emoticons. All participants were, however, computer literate as evidenced by the demographic survey's finding that all participants used at least one CMC medium at least once per day and all attested to using CMC for social purposes though the exact nature of interlocutor was not clear.

Participants were recruited through a combination of word of mouth, in class recruitment presentations, and distribution of recruitment posters and online posts, all of which targeted the women belonging to the age groups outlined above.

4.2. Materials

For this experiment, a computer in the University of Victoria Phonetics Laboratory equipped with E-Prime 2 software was used to administer a priming task. Two photographs of a young male Caucasian face unfamiliar to the participants were used for the facial expression primes.[2] One photograph showed a smiling face and the other a frowning face. Other primes were as follows: :), :(, *happy*, and *unhappy*[3]. Ten words of each valence (positive/negative) adapted from Hsu et al. (2008) and Andrews et

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[2] The faces used were drawn from the Max Planck Institute's FACES database (Ebner, Riediger, & Lindenberger, 2010).

[3] The use of the morphologically complex term "unhappy" was later found to be somewhat suspect as the word primes elicited both higher error rates as well as longer reaction times than the other prime types. For further discussion, see Section 6.3.

al. (2011) were used as targets. Positive targets were: *pleasure, ecstasy, happiness, cheer, delight, cheerful, confident, excellent, praise, good*. Negative targets were: *rage, terror, violence, pain, fatal, killer, injury, lethal, bad, anger.*

4.3. Procedure

This study, for the most part, followed the unmasked priming methodology of Aguado et al. (2007). Participants first performed a short training session where they were asked to identify the valence of presented words after the display of a neutral facial expression or nonsense string of ASCII. In the actual experimental session, stimuli were presented in two blocks of 60 trials with an optional break between blocks. Each trial began with the presentation of a fixation screen (blank white screen with a black + in the centre) for 500ms. The prime (smiling face, angry face, :), :(, *happy, unhappy*) was presented for 250ms, followed by an interval of 300ms in which participants were again presented with the fixation screen. The target was then displayed until the participant pressed either the ‘j’ or ‘k’ key to indicate their valence judgement.

Subjects were instructed to determine whether the target was positive or negative and to press the corresponding key as soon as possible. To prevent handedness effects, half of the participants were instructed to press ‘j’ for positive and ‘k’ for negative, while the other half were instructed to press ‘j’ for negative and ‘k’ for positive. E-Prime 2 software recorded response time (RT) and accuracy (ACC) data for each trial.

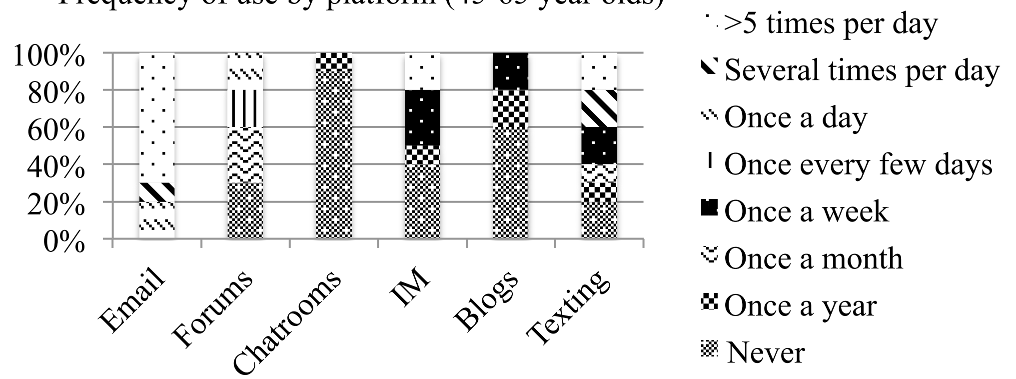
Upon completing the priming task, subjects completed a short demographic survey to ascertain age, gender affiliation, degree of experience with CMC and emoticons, and length of residence within Canada.

5. Results

5.1. Demographic Notes

In the demographic survey, participants' reported use patterns, for the most part, followed the expected lines of age. Though older women were found to be frequent users of email (see Figure 1 for details; each bar of the figure shows percentages of the responses listed to the right, within each medium, to a total of 100%), their use of most platforms was fairly limited and frequency of texting varied widely across participants.

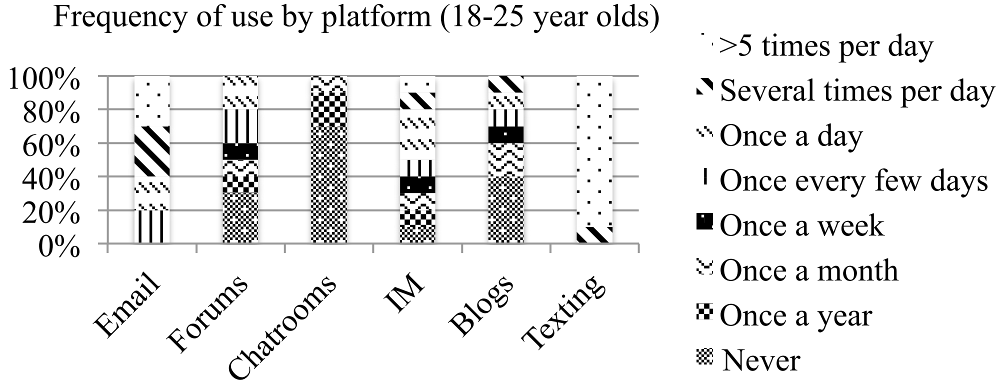
Figure 1
Frequency of use by platform (45-65 year olds)



In contrast to the older participants, younger participants had overall higher rates of CMC use (see Figure 2 for details). Fewer members of this cohort reported using email more than five times per day, but all use it at least once every few days. Unlike the older cohort, 90% of 18-25 year old participants reported texting more than five times per day. Because texting is associated with character limits and shorter messages (Ling & Baron, 2007), whereas email is generally unbounded in length, these differing patterns of use may suggest that younger participants are accustomed to finding ways to express themselves in fewer characters and, as they are working in a synchronous medium, in ways that are more analogous to speech than writing though, as Tagliamonte and Denis

(2008) argue, CMC is neither truly speech, nor writing-like but is in fact a whole new hybrid register. Older participants using asynchronous email may, however, still be writing in more full-form, formal structures (in the model of letter writing) that drives decreased use of emoticons and less speech-like or CMC forms.

Figure 2
Frequency of use by platform (18-25 year olds)

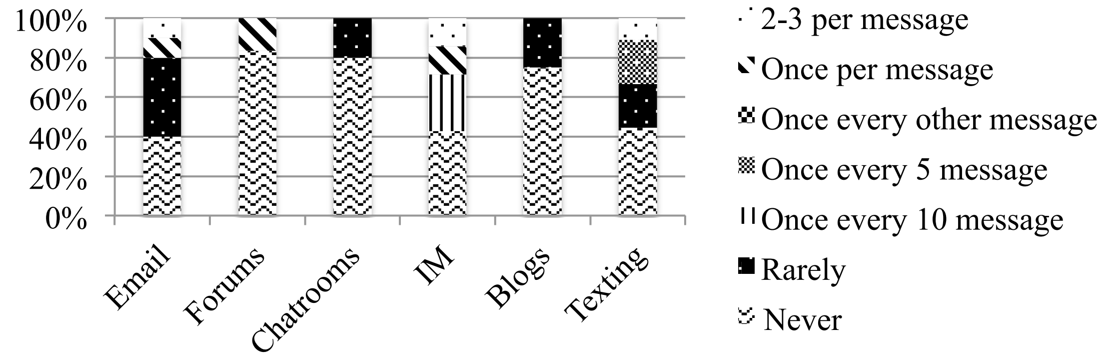


In terms of emoticon use, around 80% of the 45-65 year olds reported in the demographic survey that they never, or only rarely, use emoticons in email, forums, chatrooms, and blogs. Though some older adults attested to using emoticons more frequently in IM and texting, their use remains comparatively low and is cleanly split between the majority of rare users and the minority of very frequent[4] (2-3 per message and once per message) users (see Figure 3 for details).

[4] All instances of 2-3 per message came from the same participant who also mentioned using CMC to communicate with her adult child and her grandchildren.

Figure 3

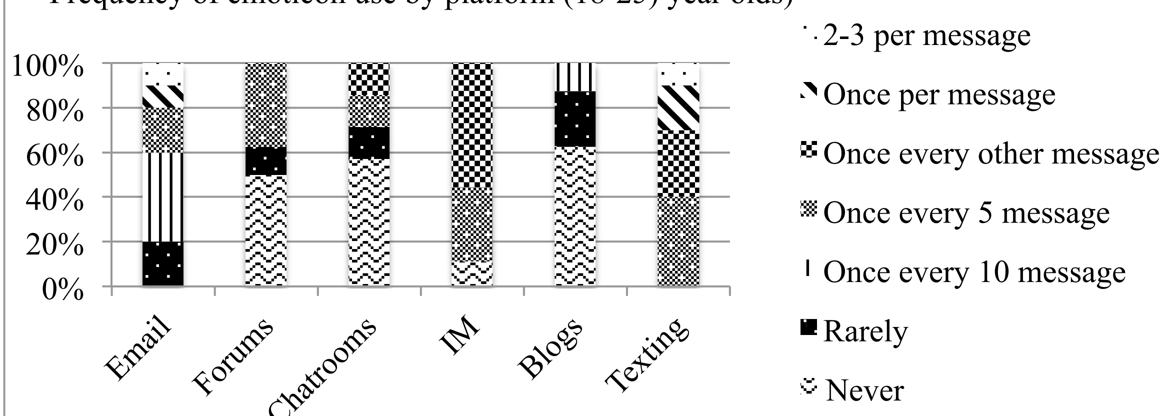
Frequency of emoticon use by platform (45-65 year olds)



The 18-25 year-old participants show a much greater range of emoticon use. Though emoticon use is still fairly infrequent for most users in forums, chatrooms, and blogs, all participants use emoticons at least once every five messages in texting, and all use emoticons at least occasionally in email. There is also a much larger presence of users in the mid frequency categories such as once every other message and once every five messages (see Figure 4 for details). Overall, the younger cohort of users prove to be much more frequent users of emoticons than older users.

Figure 4

Frequency of emoticon use by platform (18-25) year olds)



In light of CMC and emoticon use patterns across the two age cohorts, the effects of age found in the priming experiment may actually be effects of regularity of use. Of course, frequency of use may also be a result of familiarity and exposure as the 18-25 year old cohort has not known a time before emoticons (invented in 1982 by Fahlman (n.d.)), where the 45-65 year olds came of age in a world devoid of emoticons and are much less reliant upon CMC.

5.2. Experimental Results

Due to large participant-internal variance in RTs (standard deviations of more than 40% of the mean RT after removal of outliers and inaccurate responses), the data from two of the 45-65 year old participants were called into question. These two participants seemed to experience unusual difficulty with the task, pausing to ask the researcher questions and seek task clarification mid-experiment. In an independent samples t-test comparing the two anomalous participants with the remaining 18, these two participants were found to be significantly different from the rest of the participants ($p<0.001$) and so the data from these two participants were excluded. Amongst remaining participants, data that fell outside of the normal distribution (as defined by explorative boxplots produced for each permutation of age, prime type, and congruence by SPSS 19), amounting to 7.1% of accurate responses, were also excluded. Overall, 97.8% of responses were accurate, and, as seen in Table 1 which shows numbers of accurate and inaccurate responses as a percentage of the total responses for each age group and prime type, patterns of accuracy were consistent across age groups. Thus, considering only accurate results does not conflate disparate groups and so, for the purposes of analysis, only the RTs from accurate trials were considered. Interestingly, for both groups, an

ANOVA, used to pick apart multiple interacting factors, found that prime type was the only significant main effect in predicting rates of error $F(2,2010) = 4.93$, $p<0.05$. A conservative post hoc Tukey test revealed that words were significantly less accurate than emoticons ($p<0.05$). Faces, however were not statistically separable from either emoticons or words, though the words and faces comparison was much closer to significance than words and emoticons ($p = 0.09$ versus $p = 0.51$) (see Section 6.3 for an explanation of methodological limitations that may have driven this finding).

Table 1

Accuracy of responses

Age	Prime Type	Accurate		Inaccurate	
18-25	Emoticon	363	98.6%	5	1.4%
	Face	369	98.4%	6	1.6%
	Word	352	96.2%	14	3.8%
	Total:	1084	97.7%	25	2.3%
45-65	Emoticon	300	99.3%	2	0.7%
	Face	292	97.7%	7	2.3%
	Word	290	96.7%	10	3.3%
	Total:	882	97.9%	19	2.1%
Total:		1966	97.8%	44	2.2%

5.2.1. Statistical Analyses. For this study, a series of ANOVAs were used to pick apart the effects and interactions of the range of independent factors in the study (see Appendix A for a summary table of ANOVA findings). Initial analyses treated age of participant, type of prime, and congruence of prime and target as independent variables in a 2x3x2 design. Congruence, however, in spite of being frequently assessed as a factor in affective priming paradigms (e.g. Aguado et al., 2007; Spruyt, Houwer, Hermans, & Eelen, 2007), was found to be a less accurate predictor of RT trends than either the valence of the prime or the valence of the target. Thus, analyses were adjusted to consider the following independent variables in a 2x3x2x2 design: age (18-25, 45-65), prime type (emoticon, photograph of facial expression, word), prime valence (positive, negative), and target valence (positive, negative).

Significant main effects were found for age $F(1,1966) = 590.00$, $p<0.001$, prime valence $F(1,1966) = 6.06$, $p<0.05$, and target valence $F(1,1966) = 8.83$, $p<0.001$. There was also a significant three-way interaction found between these factors $F(1,1966) = 3.95$, $p < 0.05$. Due to the size of the sample ($N = 18$), only these few factors were statistically significant and, as such, non-significant trends are also considered and discussed as predictors of potential significant effects in larger samples.

5.2.2. Effects of age. Age was found to be the best predictor of RT overall with participants from the 45-65 cohort taking significantly $F(1,1966) = 590.00$, $p<0.001$ longer to respond than the participants from the 18-25 cohort ($M = 800.20$ms, $SD = 176.58$ms versus $M = 623.79$ms, $SD = 147.04$ms). Beyond the raw differences in RT, response patterns surrounding prime type and valence effects also differ across the two age cohorts. The younger participants were not only faster overall, but also produced more interpretable results.

5.2.3. Effects of prime type.

Though prime type was not a statistically significant factor[5], Table 2 reports the general trends in terms of mean reaction time for prime type. Overall, faces tended to result in the fastest RTs (M = 694.69ms, SD = 187.31ms). Emoticons and words elicit somewhat slower responses at means of 705.65ms (SD = 184.91ms) and 708.61ms (SD = 183.30ms) respectively. Given the large standard deviations and relatively small difference of means, however, these trends may not hold within a larger sample. In fact, when the sample is split by age cohort, two separate patterns emerge depending upon the age of the participant.

Table 2

RT by prime type

Prime Type	Mean	N	Std. Dev.
Emoticon	705.65	663	184.91
Face	694.69	661	187.31
Word	708.61	642	183.30

Though mean times were quite different across cohorts, for both groups, faces consistently elicited faster response times than words as seen in Table 3 below.

The most interesting difference between the age groups, however, is the difference in the way that emoticons pattern. Within the 18-25 year-old group emoticons triggered RTs very similar to those elicited by faces. The mean RT for emoticons was 621.65ms (SD = 150.26ms), while faces elicited a mean RT of 621.09ms (SD = 148.51ms). Though the

[5] Prime type was not found to be significant in this study (p = .38, see Table 1 for further statistical details) but it is expected that, given the variation in mean RT between prime types in both age groups, a larger sample (potentially even a larger sample from a single age cohort) would bring the RT trends up to the level of significance.

difference in mean RT was not especially large, words did elicit a slower RT (M = 628.82ms, SD = 142.35ms) farther from emoticons than emoticons were from faces.

Table 3

RT for faces and words by age cohort

	18-25 Year-old Cohort				45-65 Year-old Cohort		
Prime Type	Mean	N	Std. Dev.		Mean	N	Std. Dev.
Face	621.09	369	148.51		787.70	292	190.09
Word	628.82	352	142.35		805.46	290	167.29

Unlike the younger cohort, in the 45-65 year old cohort, emoticons elicited the slowest response times (M = 807.29ms, SD = 171.56ms), more analogous to words than to faces. As with the younger cohort, faces elicited the fastest RTs with a mean of 787.70ms (SD = 190.09). Words triggered RTs similar to, but shorter than, emoticons with a mean RT of 805.46ms (SD = 167.29ms). Thus, as seen in the summary Table 4 below, for the older cohort, emoticons and words lead to similar RTs which are considerably slower than those triggered by face primes, while for younger participants, emoticons and faces pattern together with words alone showing a slower RT.

Table 4

RT by prime type and cohort

	18-25 Year-old Cohort				45-65 Year-old Cohort		
Prime Type	Mean	N	Std. Dev.		Mean	N	Std. Dev.
Face	621.09	369	148.51		787.70	292	190.09
Emoticon	621.65	363	150.26		807.29	300	171.56
Word	628.82	352	142.35		805.46	290	167.29

5.2.4. Positivity and other valence effects. As discussed above, the valences of both prime and target, taken individually, were found to be more accurate predictors of RT than the standard factor: congruence. Given the significance of age and the presence of vastly different patterns between the two cohorts, valence effects, though significant (prime valence $F(1,1966) = 6.06$, $p<0.05$, and target valence $F(1,1966) = 8.83$, $p<0.001$), were not especially meaningful when measured over both age groups. When these effects are considered within each cohort, prime valence ceases to attain statistical significance, and target valence only remains significant for the younger demographic $F(1,1083) = 5.30$, $p <0.05$. Thus the trends are broken down by cohort and further by prime type to help fully tease apart the effects of valence.

Within the younger cohort, though congruence does seem to play a role, showing preference for positive/positive or negative/negative pairings, a larger role is played by positivity which tends to drive faster RTs overall. As seen in Table 5, the fastest RTs are seen for congruent trials, but the positive/positive trial is faster (M = 592.61ms, SD = 125.38ms) than the negative/negative (M = 626.33, SD = 147.29). Amongst the two incongruent trials, the trial with a positive target is fastest (M = 634.11ms, SD = 156.60ms) and, if valence trends are compared over targets and primes independently, positive primes (M = 617.34ms, SD = 141.80ms) and targets (M = 613.59ms, SD = 143.41ms) are consistently associated with faster RTs than negative primes (M = 630.26ms, SD = 151.97ms) or targets (M = 633.91, SD = 150ms).

Table 5

RT for 18-25 year old cohort across target and prime valence

Prime Valence	Target Valence	Mean	N	Std. Dev.
Positive	Positive	592.61	267	125.38
	Negative	641.26	276	152.49
	Total	617.34	543	141.80
Negative	Positive	634.11	273	156.60
	Negative	626.33	268	147.29
	Total	630.26	541	151.97
Total	Positive	613.59	540	143.41
	Negative	633.91	544	150.00
	Total	623.79	1084	147.04

For all prime types, as shown in Table 6, positive/positive trials were fastest (M = 578.83ms, SD = 119.98ms, M = 610.80ms, SD = 131.32ms, M = 588.46ms, SD = 123.93ms). Negative/negative trials (M = 607.54ms, SD = 152.01ms) were also faster than negative/positive trials (M = 636.47ms, SD = 145.10ms) for faces. For words, however, negative/negative and positive/negative trials showed comparable mean response times (M = 631.46ms, SD = 164.11ms versus M = 631.67ms, SD = 136.61ms).

Table 6

RT for the 18-25 year old cohort in across prime types over prime and target valence

Prime Type	Prime Valence	Target Valence	Mean	N	Std. Dev.
Face	Positive	Positive	578.83	89	119.984
		Negative	659.29	94	162.337
	Negative	Positive	636.47	93	145.096
		Negative	607.54	93	152.014
Word	Positive	Positive	610.80	88	131.324
		Negative	631.67	89	136.611
	Negative	Positive	641.45	89	164.108
		Negative	631.24	86	135.278
Emoticon	Positive	Positive	588.46	90	123.925
		Negative	632.23	93	156.570
	Negative	Positive	624.53	91	161.598
		Negative	641.22	89	152.860

Interestingly, for faces positive/negative trials (M = 659.29ms, SD = 162.34ms) were slower than negative/positive trials (M = 636.47ms, SD = 145.10ms), both of which were slower than congruent trials (M = 578.83, SD = 119.98ms and M = 607.54, SD = 154.01ms), suggesting that, for faces, congruence is of primary importance, followed by target valence, whereas, for words, prime valence is most important to determining speed of response.

Emoticons also provide an interesting pattern in the RTs of the younger cohort. Though positive/positive is still the fastest by a fairly wide margin[6] as noted above, negative/positive (M = 624.53ms, SD = 161.60ms) is faster than either negative/negative (M = 641.22ms, SD = 152.86ms) or positive/negative (M = 632.23ms, SD = 156.57ms). This suggests that target valence is the most important predictor of RT and that positive words elicit faster response times regardless the positivity or negativity of the emoticon prime. Contrary to the statistical analyses which showed that target valence was the most important predictor of RT in the younger age cohort, the trends suggest that words, emoticons, and faces each rely on a different type of valence effect in determining their patterns of RTs. As shown in Table 7 below, faces are most affected by congruence (as predicted by previous affective priming studies (e.g. Aguado et al., 2007), words seem to be most reliant upon prime valence, and emoticons seem to be affected primarily by target valence.

Table 7

Most effective valence effect by prime type for the 18-25 year-old cohort

Prime Type	Valence Effect
Faces	Congruence
Words	Prime valence
Emoticons	Target valence

[6] Though both prime and target valence were found to be statistically significant ($p<0.05$ and $p<0.001$ respectively) in the overall analysis, their interaction neared, but did not reach statistical significance ($p = .06$). Thus, it is concluded that seeming effects of congruence wherein positive/positive trials are fastest, are actually the effects of combining the power of two positive elements rather than the effects of priming or congruence. In a larger sample however, it may be the case that congruence emerges as a predictive factor interacting with target and prime valence.

In the older demographic, positivity seems to have a considerably larger effect on RT than does congruence (see Table 8 for details). This is especially clear insofar as the incongruent negative prime/positive target pairs have a faster mean RT (M = 799.62ms, SD = 186.10ms) than do the congruent negative/negative pairs (M = 823.50ms, SD = 187.81). The incongruent positive/negative prime/target pair is also associated with a faster mean RT (M = 800.06ms, SD = 156.94ms) than the negative/negative pair. Despite these differences, just as with the younger cohort, positive/positive trials still elicit the fastest RTs at a mean of 778.24ms (SD = 171.71ms).

Table 8

RT for 45-65 year old cohort across target and prime valence

Prime Valence	Target Valence	Mean	N	Std. Dev.
Positive	Positive	778.24	225	171.71
	Negative	800.06	216	156.94
	Total	788.93	441	164.82
Negative	Positive	799.62	222	186.10
	Negative	823.50	219	187.81
	Total	811.48	441	187.12
Total:	Positive	788.86	447	179.121
	Negative	811.86	435	173.372
	Total	800.20	882	176.584

Though valence continues to be the most powerful predictor of RT, in older participants, there is less evidence that target valence is any more important to prediction of RT than is prime valence. As seen in Table 9, for the 45-65 year old cohort, with words and faces, positive elements generally tend to lead to shorter RTs.

Table 9

RT for the 45-65 year old cohort in faces and words over prime and target valence

Prime Type	Valence	Mean	N	Std. Dev.
Face	Positive Prime	780.16	146	177.205
	Negative Prime	795.23	146	202.485
	Positive Target	772.26	149	194.987
	Negative Target	803.78	143	184.150
Word	Positive Prime	795.71	146	160.566
	Negative Prime	815.35	144	173.832
	Positive Target	796.12	145	174.210
	Negative Target	814.81	145	160.118

Unlike in other conditions, when 45-65 year olds were exposed to emoticons, the trends in mean RTs seems to point to a more important role for prime valence, as was seen with younger participants with word primes. Regardless of congruency, positive primes are associated with shorter mean RTs than negative primes (M = 790.88ms, SD = 156.88ms and M = 823.49ms, SD = 183.99ms respectively). Within each prime valence, however, trends differ (see Table 10 for a full breakdown of means). For positive primes, negative targets have shorter RTs (M = 787.33ms, SD = 148.53ms) than positive targets (M = 794.29ms, SD = 165.43ms); for negative primes, positive targets (M = 801.96ms, SD = 169.98ms) are faster than negative ones (M = 845.89ms, SD = 196.17ms). Thus, it seems that for older adults viewing emoticons, there may be an effect of congruence, whereby incongruent pairings facilitate responses.

Table 10

RT for the 45-65 year old cohort in emoticons over prime and target valence

Prime Type	Prime Valence	Target Valence	Mean	N	Std. Dev.
Emoticon	Positive	Positive	794.29	76	165.426
		Negative	787.33	73	148.532
		Total	790.88	149	156.884
	Negative	Positive	801.96	77	169.978
		Negative	845.89	74	196.169
		Total	823.49	151	183.990
	Total:	Positive	798.15	153	167.224
		Negative	816.81	147	176.023
		Total	807.29	300	171.559

5.3. Revisiting the research questions

Having broken down the data to find trends, it now remains necessary to reassemble these results to make sense of the initial research questions. These hypotheses were framed on the assumption, common to affective priming research (e.g. Aguado et al., 2007), that congruence effects would be found, as a result of positive primes facilitating responses to positive targets, and negative primes facilitating negative targets, and therefore the finding that valence is more powerful than congruence somewhat complicates the response to these hypotheses.

H1: Emoticons will prime words of a congruent affective valence more strongly than words, (but likely somewhat less strongly than facial expressions). Since priming effects were not found, this question is best answered by reference to general facilitation of RTs across prime types. Within the younger cohort, emoticons showed mean RTs very close to those found with faces while words lagged somewhat behind. This suggests that, as expected, emoticons are facilitating responses in ways more similar to faces than to words for 18-25 year olds. For the older demographic, however, faces corresponded to faster RTs while both words and emoticons lagged behind with longer mean RTs. This suggests that, for older participants less familiar with emoticons, they are received less like facial expressions and more like verbal expressions of emotion.

H2: Negative and positive emoticons will show different strengths of priming effect. In the case of valence effects, as discussed above, there is much to say. Within the younger cohort and across prime types, target valence was found to be a statistically stronger predictor ($p<0.05$) of RT (positive target = shorter RT) than prime valence, but there was nonetheless a clear trend toward positive primes corresponding with shorter RTs particularly amongst words and to some extent amongst faces. Given the varied determinants of RT as described by Table 7 above, until a larger sample is tested, however, it is unclear how large of a role is played by the valence of the prime, especially within emoticons which seemed to be more consistently driven by target valence than the other primes. Furthermore the seeming effects of congruence over positivity in the case of faces must not be disregarded.

Amongst the older participants, the effect of positivity were even less clear but there did appear to be somewhat more of a balance between the role of prime valence and the role of target valence. This is complicated, however, by 45-65 year olds' responses to emoticons wherein, though positive primes did seem to correlate with shorter RTs, the power of target valence was inverted with negativity (rather than positivity) facilitating faster RTs. In summary, this hypothesis was not clearly supported, but the variety of valence trends seen leave much room for further exploration.

H3: Older users will not respond as strongly to emoticon primes. The response of the older demographic to emoticons both in terms of overall RT facilitation and valence effects seems to show that they are not as strongly affected by emoticons as their younger counterparts are. First, for older participants, emoticons pattern with words rather than faces, resulting in longer overall mean RTs. In contrast, for younger participants, emoticons pattern alongside faces with faster RTs. Second, older adults, less familiar with computer use, produced overall significantly longer response times than the younger cohort regardless of prime type. Third, the trend towards incongruent priming with emoticons, suggests that older adults are not affected by the affective value of the emoticon in the same way as the younger participants for whom congruent pairs are faster than the incongruent pairs within a given prime valence. In fact, this lack of exposure may have driven the general finding that age is the most clearly significant factor ($p<0.0001$) and that when the age groups are split, the younger cohort offers more interpretable results vis-à-vis the older participants.

6. Discussion

Though statistically significant priming effects were not found in this study, the results offer interesting possibilities in the form of trends including valence effects.

Emoticons seem to behave differently than do either words or faces. Primarily, emoticons trigger differences in RT on the basis of age, and prime/target valence that are not necessarily seen with faces or words. For younger participants, emoticons seem to prime responses to positive targets, regardless the valence of the emoticon.

In contrast, amongst older participants' responses an incongruence trend with emoticons is especially interesting. That incongruent pairs are faster than their congruent counterparts suggests that, as predicted, older users do not respond to emoticons in the same ways as younger participants do. This suggests that the affective value of ASCII–based emoticons is derived through socialization and exposure rather than through innate iconicity. In fact, some older participants mentioned in the debrief following the experiment that they had not even known what the ASCII emoticons were, believing that emoticons were only the small yellow cartoon faces made available for insertion by some CMC systems. If participants were not familiar with emoticons and their social meaning in the context of CMC, then they were not consistently affected by them. Thus it is clear that emoticons are not obviously associated with emotional expressions and likely only become meaningful through exposure. There is nothing about :) that is fundamentally "happy" and nothing about :(that is innately "sad" or "angry". This suggests that these simple ASCII constellations are too simplified[7] to represent actual faces and as such only have meaning for individuals who have been appropriately socialized to the role and meaning of emoticons in CMC.

[7] It is also worth noting that Murray (1997) finds that RTs for object recognition grow progressively longer as the object is rotated from 0˚ to 180˚. Since ASCII emoticons are a 90˚ rotation of the corresponding graphic representation ☺ or ☹ it may be the case that older users are simply less responsive to the novel orientation whereas younger participants have already adapted to the 90˚ rotation and therefor have no issues with recognition.

6.1. Emoticons: effective but not affective

For younger users, who have a greater degree of experience with emoticons, the presentation of an emoticon prime did seem to speed RTs in the valence decision task. Positive emoticons were more powerful than negative ones and they seemed to have a more powerful effect on positive targets. This result may be arising as a result of the specific participant cohort targeted. Guided by Donges et al.'s (2012) finding that women have a positivity bias in affective priming research where men do not, only women were chosen for the study. As a result, it is uncertain whether this power of positivity is an effect of gender or an effect of age, use norms, or any number of other potential factors. In fact, this increased power of positive emoticons may also be related to their more frequent use as found by researchers such as Baron (2004) and Wolf (2000) and their role in ensuring cooperative communication in line with Grice's (1975) conversational maxims.

The lack of affective congruence priming, however, suggests that emoticons do not have direct correlates in emotional affect. Because faces alone showed trends towards consistent congruent priming, one may conclude that, like words, emoticons are simply not as effective in communicating affect as are facial expressions even within the younger cohort. It must also be noted that older adults did not experience the generalized facilitation effect of emoticons on valence decision tasks, with only faces enhancing their RTs. Thus, perhaps we are seeing a progression in the semantic and communicative value of emoticons. Where for older participants, they are simply symbols which lack consistent priming effects and which facilitate RTs no more than do words, for younger participants emoticons begin to facilitate RT generally but are limited to positivity effects in terms of priming. Perhaps then, as emoticons experience further “domestication” (Baron, 2007, p. 3), their affective priming power will increase and yet younger users will respond to emoticons in ways ever more similar to faces.

6.2. The affective priming paradigm

This study’s findings regarding the power of prime and target valence over congruence of prime and target pairs raises questions about the affective priming paradigm. Though perhaps congruence would have a larger role in a larger sample, the statistical significance of the valence of individual components, combined with the positivity effects found by researchers such as Donges et al. (2012), suggest that priming researchers ought to consider the effects of individual valences rather than assuming that all effects are related to congruence priming. Certainly the paradigm is well established (e.g. Aguado Garcia-Gutierrez, Castaneda, & Saugar, 2007; Andrews, Lipp, Mallan, & Konig, 2011; Zhang, Li, Gold, & Jiang, 2010) but unless the effects of valence are also explored, such priming effects may warrant further investigation.

6.3. Further research and limitations

Because of the limited sample size of this study, most all of its results and conclusions would benefit by the addition of further participants’ data. The addition of male participants may also provide interesting insights into gender differences in emoticon perception, while perhaps clarifying the nature and distribution of the positivity effect insofar as other researchers (e.g. Donges et al., 2012) have only found significant positivity effects with female participants.

To tease apart the interaction between age and familiarity with emoticons through use, further research could benefit from the inclusion of highly computer literate older adults who make regular use of emoticons across CMC platforms. Older adults that are highly computer literate are more likely to use CMC forms such as emoticons in ways analogous to their younger tech savvy peers. Thus, if emoticons are given meaning by regular use alone, such users would be more likely to respond to emoticons in ways more like the youth. If however the potency of emoticons relies upon age of exposure and early adoption in the socially critical life stage, adolescence, then the increase frequency of use should not yield youth like behaviour in tech literate older adults. This question of frequency of exposure versus age of exposure—a question which has been extensively explored in second language acquisition research on learners' language competence and development across age of exposure versus length of exposure (e.g. Stevens, 2006; Babcock, Stowe, Maloof, Brovetto, & Ullman, 2012; Tan, Loker, Dedrick, & Marfo, 2012)—opens up the possibility of much interesting research into differences of stylistic acquisition across age gradients.

Lastly, in terms of participant manipulations, it would be worthwhile to vary the age across a spectrum rather than simply delineating cohorts. This sort of spectrum of participants would better enable exploration of a potential gradient effect of emoticon and technology exposure.

In terms of the experiment proper, further work may consider the additional exploration of various kinds of emoticons (e.g. Japanese emoticons, graphic emoticons, etc.) to explore the gradient "faceness" found by Yuasa et al.'s (2001a) fMRI work on the neural activation of participants viewing emoticons. Future research would also benefit by choosing word primes that are not morphologically related. The fact that "unhappy" is morphologically related to "happy" may have reduced the power of the negative word prime. In accordance with Exemplar Theories (e.g. Pierrehumbert, 2001), which explain the parsing of lexical stimuli as the activation of clusters or previous encountered stimuli (exemplars), a complex word form such as “unhappy” will activate exemplars involving both the “un-“ prefix and the “happy” root. Thus, it potentially primes positive as much as negative affect. It may also be the case that the more morphologically complex prime, “unhappy” takes longer for the brain to parse and so leads to longer reaction times in spite of its potential to activate the positive affect of its root “happy”. The use of two unrelated and morphologically simple primes, however, would simplify the interpretation of results by reducing these confounding factors. Nonetheless, it may also be the case that since they are activating the same modality, textual interpretation, word primes may interfere with the parsing of the following target regardless of valence as they are tying up the visual lexical processing system.

As a final note with regards to word primes, future research may wish to further manipulate the visual difference between the words as primes and the words as targets. Though the two types of words were different colours and different sizes in the existing study, there still seems to have been some degree of confusion, perhaps leading to the higher error rates in word conditions versus face or prime conditions.

7. Conclusion

As an exploratory study in the priming effects of emoticons, this study found age and valence to be the best predictors of response time. In order to draw conclusions about the relationship between faces, emoticons, and words, a larger sample is required, but these preliminary results suggest that, for those more frequently exposed to emoticons, and exposed to emoticons for a greater percentage of their life and exposed to them earlier in life, the emoticons behave in ways that are more similar to faces than to words. Emoticons seem to have a unique role to play in CMC, but the exact nature of that role remains difficult to isolate. This study lays the groundwork for future studies exploring the affective effects of viewing emoticons in conjunction with textual information, as commonly occurs in CMC. As more and more interactions are mediated by devices, it becomes ever more important to understand just how users make up for the paucity of non-verbal cues while carrying out social and professional activities online.

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APPENDIX A (ANOVA Table)

Test of between subjects effects in RT					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16062024.291[a]	23	698348.88	27.146	.000
Intercept	9.855E8	1	9.855E8	38307.993	.000
PrimeType	58947.02	2	29473.51	1.146	.318
Age	15177939.17	1	15177939.17	589.999	.000
TargetValence	227174.12	1	227174.12	8.831	.003
PrimeValence	155760.77	1	155760.77	6.055	.014
PrimeType * Age	26751.06	2	13375.53	.520	.595
PrimeType * TargetValence	23664.18	2	11832.09	.460	.631
PrimeType * PrimeValence	30610.96	2	15305.48	.595	.552
Age * TargetValence	673.31	1	673.31	.026	.871
Age * PrimeValence	9287.17	1	9287.17	.361	.548
TargetValence * PrimeValence	88234.38	1	88234.38	3.430	.064
PrimeType * Age * TargetValence	13344.93	2	6672.47	.259	.772
PrimeType * Age * PrimeValence	1070.10	2	535.05	.021	.979
PrimeType * TargetValence * PrimeValence	150569.57	2	75284.78	2.926	.054
Age * TargetValence * PrimeValence	101480.40	1	101480.40	3.945	.047
PrimeType * Age * TargetValence * PrimeValence	18649.13	2	9324.56	.362	.696
Error	49958625.71	1942	25725.35		
Total	1.037E9	1966			
Corrected Total	66020650.00	1965			
a. R Squared = .243 (Adjusted R Squared = .234)					