# Sarcasm in written communication: Emoticons are efficient markers of intention

Dominic Thompson and Ruth Filik
*University of Nottingham, UK*

**Abstract**

Here we present two studies that investigate the use of emoticons in clarifying message intent. We look at sarcasm in particular, which can be especially hard to interpret correctly in written communication. In both studies, participants were required to make the intentions of their messages clear. In the first, they clarified the meaning of existing sentences without altering the wording; in the second, they produced their own sentences. Results provided clear evidence that tongue and wink emoticons are the principal indicators of sarcastic intent, and that ellipsis is associated more with criticism, rather than with sarcasm. These findings highlight the significant role emoticons play in clarifying message intention, compensating for the absence of non-verbal cues in written communication.

**Keywords**

emoticons, irony, sarcasm, text messaging, CMC, language production, pragmatics

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Emoticons are symbols produced by creatively repurposing and combining existing characters to represent something new: signifying something absent in written language, or something more effectively 'said' through symbol. They most frequently take the form of expressive faces, such as **:D**, **>:(**, **-_-**, or **(^o^)**, but can also include other symbols, like **<3** (heart). By using existing characters, emoticons can be easily produced on any keyboard or device, and can easily be altered or new ones created to suit a given context. The commonly-used sideways emoticons (e.g., **:-)**) originated in Western culture (Dresner & Herring, 2010). There are also a variety of other emoticon types, which Dresner and Herring (2010) claim are specific to certain cultural contexts, such as kaomoji (right way up emoticons **^.^**) being specific to Japan. However, these other categories of emoticon are being used more and more frequently across various cultures and contexts. In this paper we concentrate on those emoticons that can be produced using only the symbols on a standard keyboard, incorporating both 'Western' emoticons and kaomoji (not to be confused with emoji - ready-made symbols, such as 😒). We investigate the use of emoticons in clarifying potentially ambiguous comments; specifically the use of emoticons to make it clear that a message is either intended to be taken literally, or to be taken sarcastically.

Although the term 'emoticon' was originally a blend of 'emotion' and 'icon', emoticons now represent an ever growing set of symbols that go far beyond indicating emotion. In fact, research suggests that signalling emotion is a rather minor function of emoticons. For example, Dresner and Herring (2010) note that emoticons tend to communicate pragmatic meaning, rather than emotion; for example, the inclusion of certain emoticons may make a request less forceful. Likewise, Skovholt, Grønning, and Kankaanranta (2014), claim that emoticons are

pragmatic markers, their main purpose being to contextualise or modify an utterance, not to indicate emotion; one such example is the use of 'hedges' - terms that alter the speaker's degree of 'commitment' to their statement. In support of this, a study of 6000 instant messages found that just 12% of emoticons were used in expressing emotion (Luor, Wu, Lu, and Tao, 2010).

Emoticons have, however, been shown to strengthen messages. For example, if an emoticon has the same valence as a message, that valence is increased (Ip, 2002). Positive emoticons have been shown to increase positive feelings (Derks, Bos, & von Grumbkow, 2008; Luor et al., 2010); however, neutral emoticons seem to have very little effect (Luor et al., 2010). Conversely, emoticons may also be used to soften the impact of potentially negative messages, such as rejections, requests, or complaints (Skovholt et al., 2014). Research by Huang, Yen, and Zhang (2008) suggests that the use of emoticons in general makes communication more enjoyable overall.

Based on a study of online message boards, Wolf (2000) suggests that females use fewer emoticons than males, and use them in more varied contexts, with males mostly using them for sarcasm and teasing. However, these findings should be viewed very cautiously, since the effects are likely to have been heavily influenced by the topics of the message boards examined. While the male dominated message board was about football, the topic of the female dominated message board was 'eating disorder support', an area unlikely to be associated with sarcasm or emoticon use in general. In a study of twenty-one students, Tossell et al. (2012) found a tendency for males to use a wider range of emoticons. However, studies with significantly more participants (80 and 226 participants, respectively) have found no gender differences in the use of emoticons (e.g., Hancock, 2004; Walther, & D'Addario, 2001).

In early research (Walther & D'Addario, 2001) it was suggested that emoticons could function in a similar way to fixed expressions, such as "How do you do?" (Malinowski, 1923/1946); rather than carrying any specific meaning, they performed a social function.

Emoticons have also been compared with punctuation, either serving to enhance it (Garrison, Remley, Thomas, & Wierszewski, 2011), or actually functioning *as* punctuation (Markman & Oshima, 2007). This latter suggestion may partly explain why, according to Ip (2002), emoticons are more effective at increasing valence ratings in the absence of standard punctuation (Ip, 2002). Filik et al. (in press) also found that emoticons had a greater emotional impact than exclamation marks. The idea that emoticons may function as punctuation may explain why emoticons tend to appear at the start or end of an utterance (Garrison et al., 2011; Provine, Spencer, & Mandell, 2007). Provine et al. (2007) relate this latter phenomenon to the 'punctuation effect', whereby laughter and other non-verbal vocalisations occur in predictable locations: the start and end of an utterance, and phrase boundaries.

Rather like punctuation, some researchers claim the use of individual emoticons is conventionalised (Skovholt et al., 2014) or semi-conventionalised (Garrison et al., 2011). Certain emoticons do appear to have a high level of agreement on how they should be used, at least in broad categories such as **:-)** representing happiness, or **:-(** indicating sadness (Walther, & D'Addario, 2001). However, it is not the case that there is a simple one-to-one relationship between a given emoticon and a specific meaning (Dresner & Herring, 2010) and emoticons are often employed creatively (Garrison et al., 2011).

This creativity allows emoticons to perform various roles, and it is often assumed that they help to fill a gap in written communication: while spoken interactions benefit from a range of nonverbal cues (such as gestures, facial expressions, tone of voice), these are absent in writing. Without such cues, there is a heightened risk of misinterpretation, especially since computer mediated communication allows written conversations with a level of immediacy close to that of speech. Facilitating correct interpretation of a message appears to be a major function of emoticons (Dresner & Herring, 2010; Lo, 2008), for example by marking humour

(Adams, 2012) or sarcasm (Filik et al., in press; Walther, & D'Addario, 2001), or indicating a positive attitude, jokes, or irony (Skovholt et al., 2014).

An ironic or sarcastic message can easily be misunderstood, especially in written communication. Irony takes various forms, which usually involve saying one thing with the intention of communicating the opposite (for other forms of irony, see for example Adams, 2012); for example, if Samantha has suggested fixing a broken teacup with sticky tape, Aaron may respond with *Great idea!*. This indirectness clearly increases the chances of a person's intentions being misinterpreted. In spoken communication, Aaron's ironic intent may be signalled via an appropriate tone of voice or gesture. However, in written conversation, the lack of such nonverbal options may result in Samantha reading Aaron's comment literally, and wrongly believing that her idea is in fact great. In the literature, the terms *sarcasm* and *irony* are sometimes used interchangeably; however, sarcasm is generally accepted as a form of irony directed at a person, usually reflecting some degree of negative attitude (Kreuz & Glucksberg, 1989). It is this form of irony that the current paper considers.

As with the use of emoticons, irony is associated with diverse emotions and attitudes: it can be used to criticise or to praise; it can be used with humour (Roberts & Kreuz, 1994) or aggression (Blasko & Kazmerski, 2006); and may enhance (Leggitt & Gibbs, 2000) or weaken (Dews & Winner, 1995) the strength of a message. These varied functions add further possibilities for misinterpretation.

Several emoticons and devices have been cited as markers of irony. Carvalho, Sarmento, Silva, and de Oliveira (2007) suggested that irony could be indicated by positive emoticons, such as **:)**, **;-)**, or **:P**. Others found that mixed messages (a positive message with a negative emoticon, or vice-versa) were rated as more sarcastic, as well as more ambiguous (Derks, Bos, & von Grumbkow, 2008b). Contrary to this, Walther and D'Addario (2001) found that mixed messages were not rated as more sarcastic, though they did find the majority of their

participants rated the wink face (in isolation) as sarcastic. According to Hancock (2004), ellipsis (triple dot often used to indicate deleted or elided text; **...**) is the most frequent marker of irony; however, this remains unclear, since Hancock also appears to code incidental uses of ellipsis (e.g., marking a pause) as indicating irony specifically (see Vandergriff, 2013).

These earlier studies have generally either relied on ratings to establish appropriateness of specific emoticons for indicating sarcasm by presenting a small set of emoticons to choose between, or have considered relatively infrequent occurrences of sarcasm in larger discourses. Here we present two experiments in which, rather than being receivers or observers of messages, participants were directed to *produce* messages ensuring the receiver would correctly interpret their intentions as either literal or sarcastic.

**Aim and hypotheses**

Our aim is to reveal how emoticons are used in clarifying sarcastic versus literal intent. Sarcasm (and irony in general) is especially likely to be misunderstood in written communication, as it involves deciphering a meaning that is often the opposite of what is said. For example, if taken literally, the comment *Great idea!* is an instance of praise, but taken sarcastically, it is an instance of criticism. Likewise, if taken literally, a comment such as *That looks terrible!* is an example of criticism, but taken sarcastically, it is an example of praise.

Rather than rating specific emoticons or choosing from a set, the two studies discussed here allow participants to freely produce emoticons. This will enable us to see which emoticons are preferred when explicitly marking sarcastic and literal criticism and sarcastic and literal praise, as well as the range of emoticons used by participants. We expect participants will use a broad range of emoticons, with a smaller subset being used most frequently (see Tossell et al., 2012). Based on earlier research (Carvalho et al., 2007; Walther & D'Addario, 2001), we also expect the wink emoticon to occur most frequently when marking sarcasm. Although

mixed messages have been associated with sarcasm, we do not expect participants to use this approach, since mixed messages also create ambiguity (Walther & D'Addario, 2001). If Hancock (2004) is correct, we would expect ellipsis to occur more frequently in sarcastic comments versus literal. However, if Hancock's analysis is flawed, as suggested by Vandergriff (2013), ellipsis may occur with similar frequency across all conditions.

In both experiments, participants saw short written conversations between themselves and a friend. We chose to utilise a friendly relationship since conversations via text message are intuitively more common between friends than other, more formal relationships. It has also been observed that emoticon use is more frequent between friends (Derks, Bos, & von Grumbkow, 2008a), maximising the chances of our participants producing emoticons. They will be tasked with producing responses in which their intentions should be clear to the receiver (being either clearly sarcastic, or clearly literal). In the first experiment, the final comment of the conversations will be given (such as *I thought it was so interesting*) and they will be asked to make their intentions clear without altering the wording. In the second experiment, participants will be asked to produce their own final comment that makes their intentions clear. While the first will allow the underlying valence of the sentences to be controlled, and maximise the likelihood of eliciting emoticons, the second will allow us to see how frequently emoticons are used in each condition when alternative methods of clarification are freely available (such as explicit linguistic signalling).

## Experiment 1

Experiment 1 examined the effects of sarcastic versus literal comments, criticism versus praise, and the combination of these. This was done by having participants adapt messages (such as *You looked confident*) so that their intentions would be clear to the recipient. This allowed us to investigate how emoticons and other devices are employed for the purposes of clarifying

meaning in literal versus sarcastic messages, as well as in praising and criticising versions of each.

**Participants**

Fifty-one native-English speakers completed the study (14 males, 3 undisclosed; age 18-40, mean age = 26.81, SD = 6.07). Participants had no reading or learning difficulties and were recruited through the University of Glasgow participant database. For taking part, participants were entered into a prize draw offering the winner a choice of a £20 Amazon voucher or a Skyrim-inspired fleece hat. Participants gave informed consent prior to taking part, and were free to ask questions or to withdraw at any time.

**Materials and design**

Twenty-four sets of materials were created, each with four variants (see Table 1 for an example). Participants were asked to edit the final comment of each scenario with the aim of making it clear that the comment was intended to be taken either literally or sarcastically. This manipulated the factor *Intention* (literal vs. sarcastic). Additionally, the final comment of each conversation was either superficially positive (e.g. *Great idea!*) or superficially negative (e.g. *Terrible idea!*). When a superficially positive comment is intended seriously, its message remains positive - it is an instance of praise. However, when a superficially positive comment is intended sarcastically, its message becomes negative - an instance of criticism. Likewise, the opposite is true for superficially negative comments. This represented the manipulation of the factor *Polarity* (praise vs. criticism).

The 24 items × four conditions were distributed to four separate lists in such a way that each item appeared once per list, in a different condition in each list. Each list contained six items per condition. Interspersed with the 24 critical items there were 24 fillers materials,

resulting in 48 trials in each list. Fillers followed the same structure as the critical items, but asked participants to indicate other intentions, such as *How would you make it clear you are annoyed?*.

**Procedure**

To take part, participants responded to an advert posted to the University of Glasgow participant database, and were randomly assigned to one of the four lists. They were each sent a Word document containing an information sheet, a consent form, and the experimental task. They were instructed to imagine the conversations as being between themselves and a friend via text-message. They were told their task was in each case to make their intentions clear by making changes to the final comment of each conversation; however they could not add or remove any words, so they needed to think of other ways their intentions could be indicated. These instructions were written to avoid direct mention of emoticons and therefore avoid priming their use, or making the experimental aim clear. The inability to change words narrowed their options, but did not leave emoticons as the only available option. Indeed, some participants produced no emoticons at all, and it was rare for participants to use emoticons only. Responses were made in the document and returned via email after completion.

**Results**

Analyses were carried out in SPSS Statistics 21 using Generalised Estimating Equations (GEE; see Hanley, Negassa, & Forrester, 2003; Hardin & Hilbe, 2003), an expansion of Generalised Linear Models (Nelder & Wedderburn, 1972). We used the GEE model to predict the likelihood of producing specific emoticons as a function of literality and polarity, and the interaction between these. With a binary dependent variable in each case (present vs. absent), the model employed a *binomial* distribution and *logit* link function; that is, a binary logistic

regression model. Below we report Generalised Score chi-squares. For the purposes of analysis, we defined emoticons as any symbols produced via the combination of existing characters for purposes beyond punctuation.

***Overall***

In Experiment 1, participants produced 72 different emoticons, as well as using several different types of punctuation or other strategies. Although the distribution of these other non-emoticon strategies would be of interest, they were produced far less often than emoticons, and (with one exception discussed below) no single one of these occurred with enough frequency to allow meaningful analysis.

Analysis of likelihood of using an emoticon revealed a main effect of literality ($\chi^2_{(1)}$ = 24.59, $p < .001$) whereby an emoticon was significantly more likely to be included in sarcastic comments (.88 ± .03) than in literal comments (.51 ± .04) (mean likelihood ± SE). There was also a main effect of polarity ($\chi^2_{(1)} = 4.55$, $p = .033$) whereby emoticons were more likely to occur in praise (.76 ± .04) than in criticism (.71 ± .03). These factors did not interact ($\chi^2_{(1)}$ = 1.03, $p = .311$).

***Emoticon categories***

For the next stage of analysis, given the very large range of emoticons produced, they were collapsed into logical categories, determined by the presence of shared elements. For example, several variants on the basic 'smile' emoticon (such as **:)**, **:-)**, and **:]**) were collapsed into a single category. A small number of emoticons fell into two categories, in which case they were included in both; for example, instances of **;p** were included in both the wink and tongue categories. Of the resulting categories, those with very small numbers of observations (n < 20) were excluded. The final categories were tongue face **:p**, wink face **;)**, frown face **:(**, diagonal

face **:/**, and smile face **:)**. Each had a minimum of 145 observations. For each of these categories separate analyses were carried out, considering the likelihood of each occurring as a function of literality and polarity, and any interaction between the two. Since ellipsis has been previously suggested as a marker of sarcasm (Hancock, 2004), and also occurred frequently in this experiment, it has been included as a category here. Means and standard errors for effects of literality are given in Figure 1. Means and standard errors for effects of polarity are given in Figure 2.

Analysis of ellipsis (**...**; n = 375) showed a main effect of literality ($\chi^2_{(1)} = 21.24$, $p < .001$) whereby ellipsis was significantly more likely to occur in a sarcastic comment than in a literal comment. There was also a main effect of polarity ($\chi^2_{(1)} = 23.07$, $p < .001$) indicating that ellipsis was more likely to occur with criticism than praise. These two factors also produced a significant interaction ($\chi^2_{(1)} = 5.65$, $p = .017$): while in literal comments ellipsis was significantly more likely in criticism (.52 ± .07) than praise (.06 ± .04), this effect was less pronounced for sarcasm (criticism: .77 ± .06; praise: .50 ± .07).

Analysis of tongue face emoticons (those containing a tongue element, e.g., **:-p**, **:p**, **8-p**; n = 446) revealed a main effect of literality only ($\chi^2_{(1)} = 31.87$, $p < .001$). Tongue face emoticons were significantly more likely to occur with sarcastic than with literal comments. No other effects were significant (all $\chi^2$s < 2.5, $p$s > .12).

Analysis of wink face emoticons (those containing a wink element, e.g., **;)**, **;-)**, **;0**; n = 355) revealed a main effect of literality ($\chi^2_{(1)} = 29.69$, $p < .001$), indicating that wink face emoticons occurred more frequently with sarcastic than literal comments. No other effects were significant (all $\chi^2$s < 1.1, $p$s > .29).

Analysis of frown emoticons (those containing a down-turned mouth element, e.g., **:(**, **:-(**, **>:-(**; n = 162) showed a main effect of polarity that was approaching significance

($\chi^2_{(1)}$ = 3.52, $p$ = .061), where frowns were more likely with criticism than praise. No other effects approached significance (all $\chi^2$s < 2.1, $p$s > .15).

Analysis of diagonal face emoticons (those containing a slanted mouth element, e.g., **:/**, **:**, **:-/**; n = 145) revealed a significant main effect of polarity ($\chi^2_{(1)}$ = 11.80, $p$ < .001) indicating that diagonal face emoticons were more likely to occur with criticism than with praise. This factor also interacted with literality ($\chi^2_{(1)}$ = 10.58, $p$ < .001), indicating that diagonal face emoticons were equally likely to be used in sarcastic praise and sarcastic criticism (both .15 ± .05), significantly less likely than both of these in literal praise (.02 ± .02) and significantly more likely in literal criticism (.40 ± .07) than all other conditions. The main effect of literality was not significant ($\chi^2_{(1)}$ = 0.33, $p$ = .568).

Analysis of smile emoticons (those containing a smiling mouth element, e.g., **:)**, **:-)**, **:-]**; n = 222) revealed a main effect of polarity ($\chi^2_{(1)}$ = 11.69, $p$ < .001), with smile emoticons significantly more likely to occur with praise than with criticism. Polarity was also shown to interact with literality ($\chi^2_{(1)}$ = 4.99, $p$ = .026), reflecting the finding that smile emoticons were significantly more likely in literal praise (.81 ± .06) than all other conditions (literal criticism: .04 ± .03; sarcastic praise: .17 ± .05; sarcastic criticism: .08 ± .04). The literality main effect did not reach significance ($\chi^2_{(1)}$ = 1.59, $p$ = .208).

***Nose element***

There appears to be no discussion in the literature of emoticon complexity. However, as noted above, there was a great deal of variation in the forms each category of emoticon took. One variation that was noticed in all of the categories discussed above was the use of a 'nose' element; that is, most face emoticons can optionally include a 'nose' or not (e.g. **:-)**, **;-D** vs. **:)**, **;D**). Of 1184 instances of nose-optional emoticons, we found that in 76% of cases participants used the variant without a nose.

### *Gender*

There has been some discussion in the literature of gender effects on emoticon use. Gender was not a primary focus of this study, and our sample was not balanced (67% females, 27% males, 6% undisclosed); while not ideal, this imbalance is not a significant problem for the type of analysis used here. We therefore considered whether gender influenced patterns of emoticon use. We used the same models as described above, including *Gender* as an additional predictor. We found no effect of gender on overall likelihood of producing an emoticon ($\chi^2_{(1)} = .052$, $p = .819$), nor on the likelihood of producing any of the individual emoticon categories (all $\chi^2_{(1)} < 1.1$, all $p$s $> .21$). Gender did not interact with polarity or literality (all $\chi^2_{(1)} < 1.5$, all $p$s $> .22$).

## Experiment 1 summary

In Experiment 1, we found that participants used a wide range of emoticons to clarify their intentions. They were also significantly more likely to use emoticons to aid understanding in sarcastic comments than literal ones.

Tongue face, wink face, and ellipsis were all significantly more likely to occur with sarcastic than literal comments. While tongue and wink emoticons rarely appeared in literal comments, ellipsis did, and was more likely to occur in criticism than praise. We also saw that frowns were most likely with criticism, and smiles were most likely with praise. Diagonal face emoticons were equally likely in sarcastic praise and sarcastic criticism, but were far more likely in literal criticism than literal praise.

We also found that participants were highly likely to favour the use of fewer characters, leaving out the ‘nose’ element of an emoticon. We found no differences in emoticon use between genders.

## Experiment 2

Experiment 1 identified how frequently various emoticons were used relative to each other when marking sarcastic and literal intent, as well as praise and criticism. In Experiment 2 participants were less restricted in their responses. Rather than adapting existing sentences, they were asked to produce a sentence in which their intentions would be clear to the recipient. This allowed us to investigate the frequency with which emoticons are used to mark sarcastic and literal intentions in general (i.e., when all aspects of written language are open to them).

### Participants

A new set of 113 native-English speakers completed the study (31 males, 1 undisclosed; age 17-69, mean age = 22.87, SD = 8.75). As before, participants had no reading or learning difficulties, were recruited through the University of Glasgow participant database, and were entered into a prize draw for taking part. Participants gave informed consent, and were free to ask questions or to withdraw at any time.

### Materials and design

Materials were adapted from those used in Experiment 1. To give participants greater freedom in their responses, the final comment from each conversation was removed and left blank. In Experiment 2 each of the materials had two variants (see Table 2 for an example). As before, the task was for participants to make their intentions either clearly serious or clearly sarcastic. This manipulated the factor *Intention* (literal vs. sarcastic). In Experiment 2, participants produced all content of the final sentence, rather than altering an existing sentence. As a result, there was no controlled manipulation of polarity; however, the polarity of each comment produced was coded and analysed.

The 24 items × two conditions were divided across two separate lists in such a way that each item appeared once per list, in a different condition in each list. Each list contained 12 items per condition. Once again, 24 fillers materials were included in each list, resulting in 48 trials per list. Fillers were also adapted from Experiment 1, with each one having its final comment removed.

## Procedure

The procedure and instructions followed those of Experiment 1, with the exception that participants were not restricted in their response. They were simply instructed that they could use anything they would normally use in a text message in order to get their intentions across. After completing their responses they returned the document via email.

## Results

As with Experiment 1, analyses were carried out in SPSS. We used the GEE model to predict the likelihood of producing specific emoticons firstly as a function of literality only, then, following additional data coding, as a function of both literality and polarity, as well as the interaction between the two. The model used was the same as in Experiment 1. Again, we report Generalised Score chi-squares.

### *Overall*

In Experiment 2, participants produced 50 different emoticons, and used a variety of punctuation or other strategies.

Analysis of the likelihood of using an emoticon revealed a main effect of literality ($\chi^2_{(1)} = 40.72$, $p < .001$). Participants were significantly more likely to include an emoticon in their comment when it was intended sarcastically (.51 ± .03) rather than literally (.18 ± .03).

***Emoticon categories***

As in Experiment 1, emoticons were collapsed into logical categories, with separate analyses for each. The categories were the same as in Experiment 1. For the same reasons as before, ellipsis was also included as a category. Since only literality was experimentally manipulated, we first considered the impact of this factor alone on the likelihood of using each emoticon category. These means and standard errors are given in Figure 3.

In order to have a more direct comparison with Experiment 1, participant responses were subsequently coded as either being praise or criticism. Coding was carried out by one of the authors and independently by a colleague; trials on which the coders disagreed were excluded (fewer than 3% of trials). Responses that were not directed at their interlocutor (e.g. making a critical comment about the weather) or were not clearly praise or criticism, were also excluded. The remaining 57% of trials (n = 1543) were entered into a second stage of analysis considering the likelihood of occurrence of each emoticon category as a function of both literality and polarity, and any interaction between the two. Due to a large proportion of the data being excluded from these secondary analyses, the model was unable to converge in several instances. For the instances in which the model did converge, means and standard errors for effects of polarity are given in Figure 4.

Analysis of ellipsis (**...**; n = 577) showed a main effect of literality ($\chi^2_{(1)} = 37.23$, $p < .001$), with ellipsis occurring more frequently with sarcastic comments than literal. This effect remained significant in the secondary analysis ($\chi^2_{(1)} = 42.73$, $p < .001$). A main effect of polarity was also observed ($\chi^2_{(1)} = 6.09$, $p = .014$), whereby ellipsis was more likely with criticism than with praise. These factors did not interact ($\chi^2_{(1)} = 1.5$, $p = .221$).

Analysis of the tongue face category (**:-p**, **:p**, **8-p**, etc.; n = 306) revealed a main effect of literality ($\chi^2_{(1)} = 42.00$, $p < .001$), with tongue face more likely in sarcastic than literal

comments. This effect was maintained in the second stage of analysis ($\chi^2_{(1)} = 33.04$, $p < .001$), though the model could not converge on effects involving polarity.

Analysis of wink face emoticons (**;)**, **;-)**, **;0**, etc.; n = 324) showed a main effect of literality ($\chi^2_{(1)} = 47.00$, $p < .001$), with wink face more likely in sarcastic comments than literal. Again, this effect remained fully significant in the second stage of analysis ($\chi^2_{(1)} = 35.24$, $p < .001$), though the model was unable to converge on effects involving polarity.

Analysis of frown emoticons (**:(**, **:-(**, **>:-(**, etc.; n = 50) revealed a main effect of literality ($\chi^2_{(1)} = 10.71$, $p < .001$), whereby frowns were less likely in sarcastic comments than literal. This effect was also significant in the second stage of analysis ($\chi^2_{(1)} = 5.23$, $p = .022$). No other effects were significant (all $\chi^2$s < 0.6, $p$s > .45).

Analysis of the diagonal face emoticon category (**:/**, **:**, **:-/**, etc.; n = 45) revealed no significant effects (all $\chi^2$s < 0.9, $p$s > .35).

Analysis of smile emoticons (**:)**, **:-)**, **:-]**, etc.; n = 153) revealed a main effect of literality ($\chi^2_{(1)} = 32.00$, $p < .001$), with smiles less likely in sarcastic versus literal comments. This effect was not observed in the second stage of analysis ($\chi^2_{(1)} = 1.63$, $p = .202$). However, there was a main effect of polarity ($\chi^2_{(1)} = 7.26$, $p = .007$), with smiles less likely in criticism than praise. There was also an interaction between the two factors ($\chi^2_{(1)} = 7.17$, $p = .007$): likelihood of using a smile emoticon was the same in sarcastic criticism and sarcastic praise (both .05 ± .02), but was significantly lower than these in literal criticism (.00 ± .00), and significantly higher in literal praise (.40 ± .05) than all other conditions.

### *Nose element*

As before, we compared emoticons that have the option of including a nose element. Of 1039 occurrences of nose-optional emoticons, participants used the variant without a nose in 95% of cases.

### *Gender*

As with Experiment 1, we also considered the impact of gender on emoticon production. The sample in Experiment 2 was not balanced for gender (72% female, 27% male, 1% undisclosed); however, the overall sample size was quite large (113 participants). Again we ran all models described above, with the addition of gender as a predictor. No effects of gender approached significance.

## Experiment 2 summary

In Experiment 2, participants again produced a wide range of emoticons to assist in clarifying their intentions, though not as many as in Experiment 1. As before, emoticon use was far more likely in sarcastic comments than literal comments.

We again found that tongue face, wink face, and ellipsis were far more likely with sarcastic than literal comments. Ellipsis was still associated more with criticism than praise. As before, both smiles and frowns were less likely in sarcastic versus literal comments, with frowns occurring most in criticism and smiles in praise.

Again, participants were extremely unlikely to include an emoticon's nose element. We observed no effects of gender on emoticon production.

## General Discussion

In this paper, our aim was to reveal how language users employ emoticons to make their intentions clear in written communication. While previous research has noted the co-occurrence of certain emoticons in sarcastic comments, here we sought to provide empirical evidence to reveal which emoticons are actually used to signal sarcastic versus literal intent. In Experiment 1, participants were given written conversations and for each one were asked to make the intentions of the final sentence clearly sarcastic or clearly literal. They were not allowed to change words, which limited them to using emoticons and punctuation. In Experiment 2, participants were given similar written conversations, but this time were asked to produce a final sentence that would be interpreted clearly as sarcastic or literal. Neither experiment explicitly mentioned the use of emoticons.

Despite having no mention of emoticons in the instructions, emoticon use was prevalent in both experiments. As one might expect, participants produced more emoticons in Experiment 1, where they were unable to change the wording of the sentence, versus Experiment 2, where they were free to produce a full sentence. Similar to the findings of Tossell et al. (2012), smaller subsets of emoticons accounted for a large proportion of uses. Interestingly, in both experiments, participants were significantly more likely to use emoticons in sarcastic contexts than in literal contexts. This may indicate that sarcasm intrinsically involves more emotion than literal language (e.g., Filik, Hunter, & Leuthold, 2014). Alternatively, given that the task was to make intentions clear, this supports the assumption that sarcasm is harder to accurately communicate than literal language. This also suggests that emoticons play an important role in clarifying the meaning of a message, providing some compensation for the absence of non-verbal cues that are available in speech. This act of clarification, rather than simply indicating emotion, provides evidence in support of views expressed in recent research by Dresner and Herring (2010) and Skovholt et al. (2014). Perhaps

this added clarity is a contributing factor to the increased enjoyment of communication noted when emoticons are used (Huang et al., 2008).

In both experiments, tongue face, wink face, and ellipsis all occurred significantly more frequently with sarcastic than literal comments. However, ellipsis (**...**) seems to be more associated with criticism, occurring frequently in both literal and sarcastic criticism but very infrequently with literal praise. Since ellipsis also occurs in sarcastic praise, this may indicate that an element of criticism is still present in sarcastic praise. Ellipsis has not generally been associated with negativity, but has been said to leave room for "dialogic expansion", indicating "unassertiveness" (Vandergriff, 2013, p8). When used with criticism, this unassertiveness is likely to soften a negative comment, indicating that the criticism does not represent a fixed viewpoint or a problem that cannot be overcome. Hence, ellipsis marks criticism indirectly, via a desire to soften the impact of the comment, at least in conversation with a friend, as examined here. This contradicts Hancock (2004), who suggests ellipsis is actually the primary marker of sarcasm. Diagonal face emoticons (**:/**) followed a similar pattern to ellipsis, occurring mostly in literal criticism, as well as in sarcastic comments. This suggests that the diagonal face may also indicate unassertiveness. However, this was only significant in the first experiment.

In contrast, and partly in line with earlier work (Carvalho et al., 2009; Derks et al., 2008), the tongue (**:p**) and wink (**;)**) emoticons appear to be closely linked with marking sarcasm. Both emoticons were used almost exclusively in sarcasm. Interestingly, they were still highly likely to be used in Experiment 2, when participants were free to use linguistic means to clarify their intentions. Importantly, this suggests emoticons may actually be more efficient than 'standard' language for marking sarcastic intent. That is, the intention can be communicated more quickly via an emoticon than via additional words or phrases, in a way somewhat similar to non-verbal cues in speech. It is not the case that these emoticons can *only* indicate sarcasm, but rather that sarcasm is preferentially marked using these emoticons.

However, the consistency of usage suggests that at least some emoticons may be partly conventionalised (Garrison et al, 2011; Skovholt et al., 2014).

While we have closely examined sarcastic intent, it is likely that other attitudes and emotions are preferentially marked with specific groups of emoticons and should be examined in future studies. It is also worth considering the potential disparity between intention and effect; that is, while certain emoticons may be consistently used with the intention of marking sarcasm, it is not necessarily the case that these markers are correctly interpreted by readers. We will be examining this in future work.

Contrary to previous reports (Carvalho et al., 2009), we found strong evidence that positive emoticons in general are not used to indicate sarcasm. While the potentially positive tongue and wink emoticons were shown to preferentially mark sarcasm, the basic, clearly positive smile emoticon (**:)**) was more likely to occur in literal comments, and literal praise in particular. Also, while mixed messages (e.g. a positive message with a negative emoticon) may be *rated* as more sarcastic (Derks et al., 2008), mixed messages were not used when aiming to *indicate* sarcasm. We found that frowns and smiles were used in contexts with corresponding valence (i.e. frowns in criticism; smiles in praise). This supports the suggestion that emoticons with the same valence as a message serve to increase that valence (Ip, 2002).

We also found no gender differences in our data, either in terms of overall frequency of emoticon use, or in likelihood of using any specific category of emoticons to indicate literal or sarcastic intentions. This is contrary to some previous findings (Tossell et al., 2012; Wolf, 2000), though supports other, larger studies that considered gender (Hancock, 2004; Walther, & D'Addario, 2001).

It should be noted that we considered emoticon use only in friendly relationships. It has been suggested that emoticon use is increased in communication between friends (Derks, Bos, & von Grumbkow, 2008a). It is possible that emoticon use differs in other types of relationship:

in addition to differences in the overall frequency of emoticon use, specific emoticons may function differently according to relationship type.

Finally, despite its use in the earliest emoticons, our data revealed that participants overwhelmingly prefer not to use the 'nose' element of an emoticon. While this could previously have reflected the monetary economy of producing fewer characters, message length no longer has any notable impact on cost in the majority of messaging services. More likely explanations are the reduced effort of pressing fewer keys, or the lack of expressive content provided by the nose element. The combination of these latter suggestions are in line with the Gricean maxims of quantity and manner - say no more or less than is needed, and be clear and brief, respectively (Grice, 1975). If the inclusion of a nose adds no expressive content, then intentions can be made clear using fewer characters. Reductions have been noted as a distinctive feature in text messaging (e.g., Thurlow & Brown, 2003), but this has not previously been applied to emoticons; this would be an interesting avenue for future research. The lack of expressiveness in emoticon noses may even have an evolutionary or biological foundation, reflecting the lack of expressiveness displayed by the human nose. In the Facial Action Coding System (Ekman & Friesen, 1978), only three out of forty-six 'action units' involve the nose. It would be interesting to consider whether the degree of expressiveness for other facial regions is correlated between human expression and emoticon designs.

Previous studies have primarily used rating tasks, multiple choice, or corpus analysis. Overall, our data contribute to the existing literature by using free production tasks to provide clear empirical data on the use and function of emoticons in written communication. Our results provide evidence of the significant role emoticons play in clarifying message intentions, especially in contexts that can easily be misinterpreted, such as using sarcasm. Their utility can even outweigh standard linguistic mechanisms. Our data provide clear evidence that the tongue face and wink face emoticon categories are the primary indicators of sarcastic intent. We also

found that ellipsis may not be a marker of sarcasm, but rather an indirect marker of criticism, used to ‘soften’ the impact of a negative comment. Finally, we found that participants tend to be efficient in their emoticon construction, preferring not to use the inexpressive nose element found in the earliest emoticons.

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## Tables and Figures

**Table 1**
Example of materials used in Experiment 1, with four conditional variants

| Intended interpretation | Message polarity | Text messages and question |
|---|---|---|
| literal | praise | You: So how was the interview?<br>Friend: I really can't tell...<br>You: Well, you looked confident<br><br>How would you make it clear that you are being serious? |
| | criticism | You: So how was the interview?<br>Friend: I really can't tell...<br>You: Well, you didn't look confident<br><br>How would you make it clear that you are being serious? |
| sarcastic | criticism | You: So how was the interview?<br>Friend: I really can't tell...<br>You: Well, you looked confident<br><br>How would you make it clear that you are being sarcastic? |
| | praise | You: So how was the interview?<br>Friend: I really can't tell...<br>You: Well, you didn't look confident<br><br>How would you make it clear that you are being sarcastic? |

**Table 2**
Example of materials used in Experiment 2, with two conditional variants

| Intended interpretation | Text messages and question |
|---|---|
| literal | You: So how was the interview?<br>Friend: I really can't tell...<br>You:<br><br>Make a response that clearly shows you are being serious. |
| sarcastic | You: So how was the interview?<br>Friend: I really can't tell...<br>You:<br><br>Make a response that clearly shows you are being sarcastic. |

**Figure 1**
Mean probabilities of emoticon production in Experiment 1 as a function of literality (literal vs. sarcastic); error bars indicate standard errors.

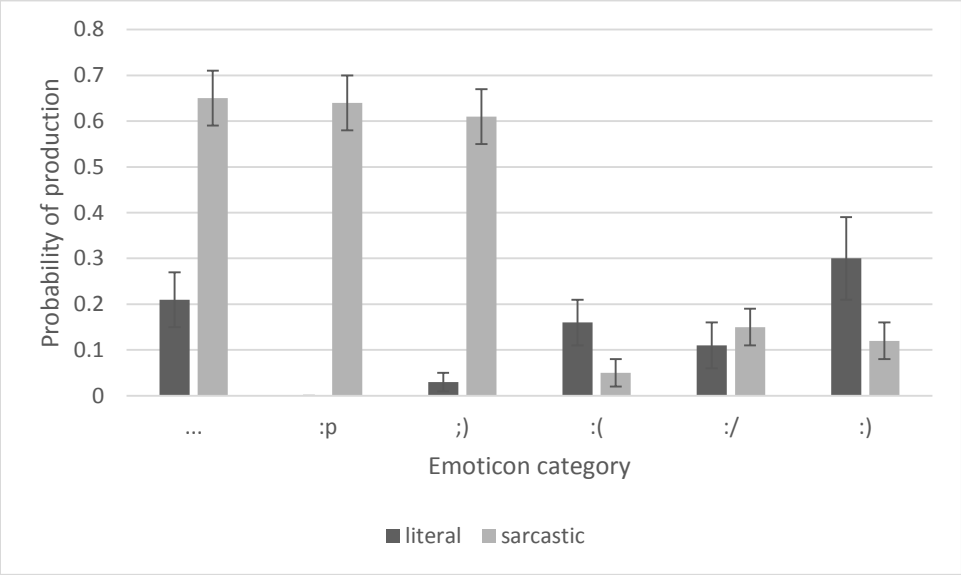



**Figure 2**
Mean probabilities of emoticon production in Experiment 1 as a function of polarity (praise vs. criticism); error bars indicate standard errors.

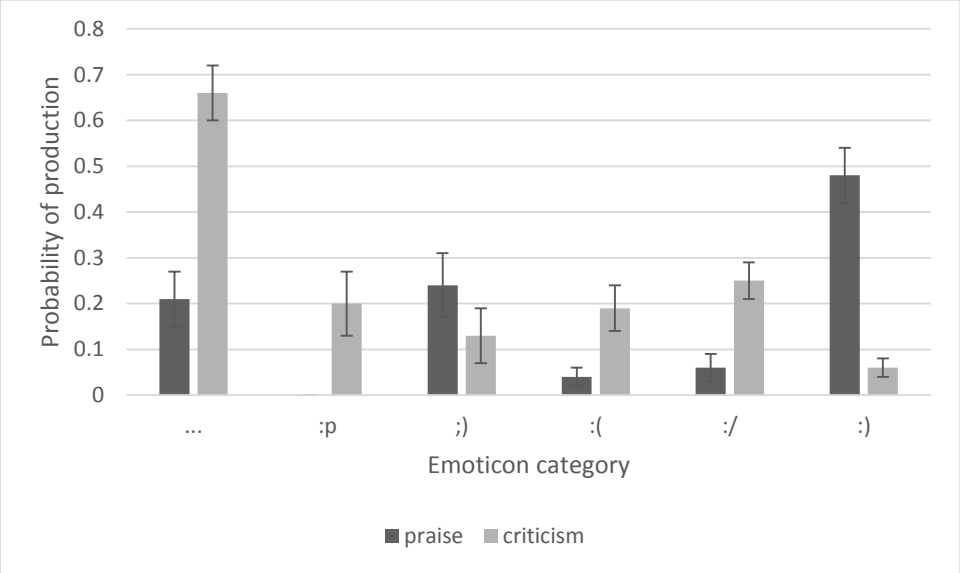


**Figure 3**
Mean probabilities of emoticon production in Experiment 2 as a function of literality (literal vs. sarcastic); error bars indicate standard errors.

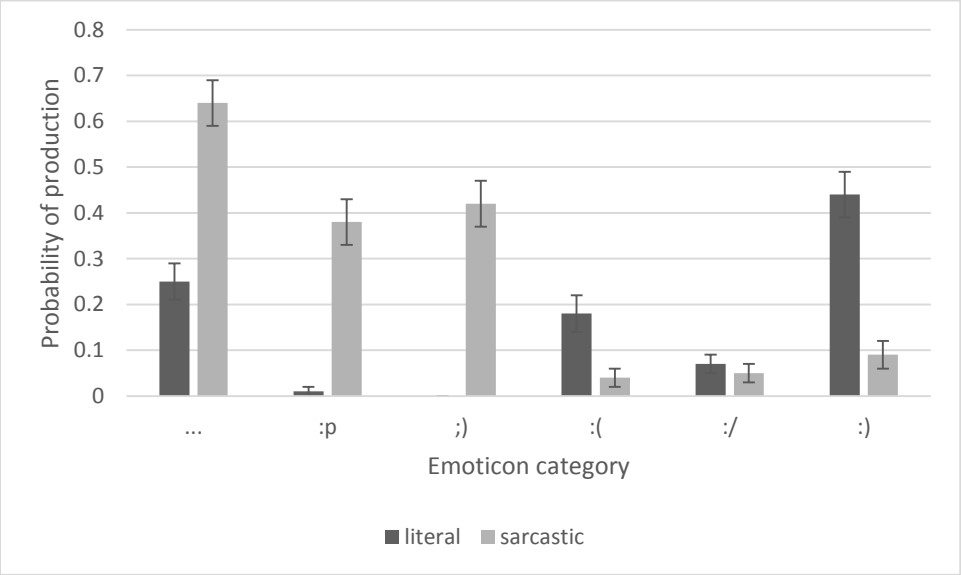
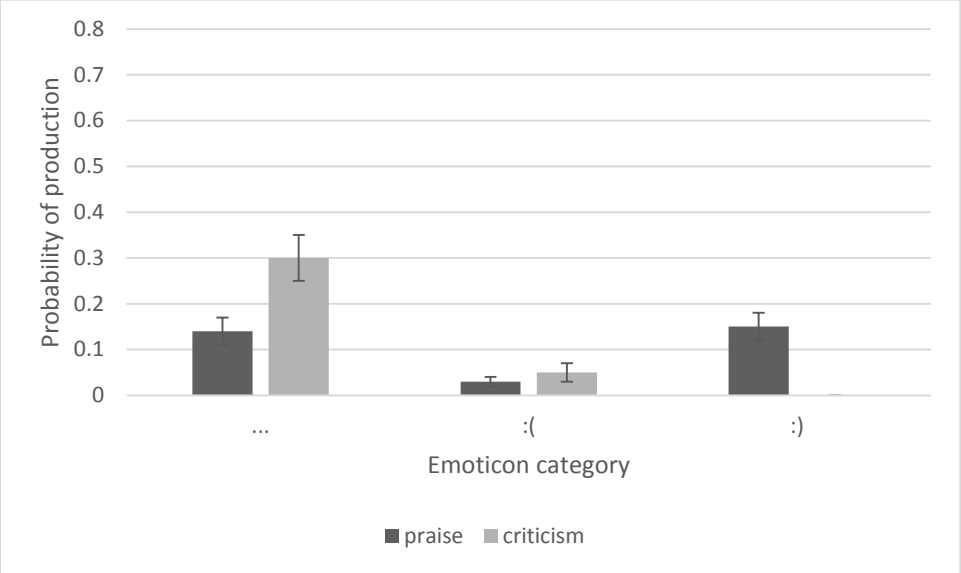



**Figure 4**
Mean probabilities of emoticon production in Experiment 2 as a function of polarity (praise vs. criticism); error bars indicate standard errors.



## About the authors

**Dr Dominic Thompson** (dominic.thompson@nottingham.ac.uk) is an Assistant Professor in the School of English at The University of Nottingham. His research examines language comprehension and production, with primary focusses on semantics, pragmatics, and emotion. **Address**: School of English, Trent Building, The University of Nottingham, University Park, Nottingham, NG7 2RD, UK

**Dr Ruth Filik** (ruth.filik@nottingham.ac.uk) is an Assistant Professor in the School of Psychology at The University of Nottingham. Her research focuses on the cognitive and neural mechanisms underlying language comprehension.