



A semantics of face emoji in discourse

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Abstract This paper presents an analysis of face emoji (disc-shaped pictograms with stylized facial expressions) that accompany written text. We propose that there is a use of face emoji in which they comment on a target proposition expressed by the accompanying text, as opposed to making an independent contribution to discourse. Focusing on positively valenced and negatively valenced emoji (which we gloss as *happy* and *unhappy*, respectively), we argue that the emoji comment on how the target proposition bears on a contextually provided discourse value endorsed by the author. Discourse values embody what an author desires, aspires to, wishes for, or hopes for. Our analysis derives a range of non-trivial generalizations, including (i) ordering restrictions with regards to the placement of emoji and text,

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(ii) cases of apparent mixed emotions, and (iii) cases where the lexical content of the accompanying text influences the acceptability of a face emoji.

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1 Introducing emoji

Emoji play a central role in digital communication. To explore this recently emerged communicative phenomenon and its relation to language, we use tools from formal semantics and pragmatics to investigate the use and interpretation of sentence-final face emoji such as 😊 and 😞 which express affective attitudes, as in example (1).¹ We view face emoji as part of multi-modal discourse that, intuitively, ‘comment on’ the text that they accompany. In this paper, we take a systematic look at the nature of the relation between emoji and text, and show that it is more constrained, in semantically interesting ways, than one might initially expect.

(1) My cousin found a \$100 bill in her sock. 😊

Present-day emoji—keyboard-based depictions of facial expressions and other things—evolved from the emoticons of the 1980s and 1990s, and the creation of the first modern emoji is attributed to Shigetaka Kurita in 1999. Apple added an emoji keyboard to iOS in 2011 and Android did so in 2013.² Emoji use has risen meteorically: by some estimates, in 2020, over 10 billion emoji were sent every day. Despite being a very recent phenomenon, emoji are extremely prevalent. Their popularity suggests that they help to fulfill important communicative needs.

In recent years, emoji use has been investigated from a variety of perspectives (see e.g., Bai et al., 2019 for a recent overview). In linguistic terms, Gawne and McCulloch (2019), Pierini (2021), and Pasternak and Tieu (2022) argue for a link between emoji and gestures; Maier (2021) argues that emoji are simply ‘little pictures,’ and applies a picture semantics based on Greenberg (2013, 2021a) and Abusch (2013, 2020). See also Scheffler et al. (2022) on the processing of emoji that replace words in sentences. In Maier’s view the main difference is between non-affective emoji, which make a descriptive (truth-conditional) contribution and affective emoji, which make an expressive (use-conditional) contribution. In other recent works, Gerke and Storoshenko (2018) and Cohn et al. (2019) explore how emoji combine to create pictorial sequences; Weissman and Tanner (2018) and Weissman (2019) explore irony effects with emoji. Much prior work on emoji uses experimental methods or corpus analysis (e.g., see Al Rashdi, 2015; Cramer et al.,

¹ In this paper we use the Apple emoji font. However, insofar as emoji on other platforms (e.g., Google, Android) are interpreted as expressing the same kinds of affective attitudes, the discussion here will generalize across platforms.

² <https://emojitime.com/>, <https://www.wired.com/story/guide-emoji/>.

2016; Sampietro, 2016; Na'aman et al., 2017). Our work builds on these prior studies but uses different tools: in pursuing a formal semantics approach, we seek to provide an explicit and predictive formal account of the relation between emoji and text.

Our focus here is on face emoji: stylized cartoon faces that express different affective states (e.g., 😊, 😞). Face emoji tend to be used much more frequently than other kinds of (non-face) emoji (see <http://emojitracker.com/>, which provides real-time information about the most frequent emoji on Twitter). Their popularity presumably stems from their resemblance to human facial expressions,³ and our desire to compensate for the absence of facial expressions, tone of voice and body language in digital communication. We remain agnostic about the precise nature of the mapping between emoji and their meaning. The emoji-meaning mapping might be completely stipulative and lexical, or the result of an iconic rule (in addition to Maier's (2021) purely iconic 'pictorial' approach, see also Grosz et al. (2021: 349) for a discussion that builds on Greenberg's (2021c) approach to the difference between symbolic and iconic semantics), or emoji might first depict faces that themselves express emotion, or the truth might be some complex hybrid of all of these. Although the details of the mapping are an important issue, they are not central for the aims of the present work. Rather than investigating how different emoji express different affective states, our interest in this paper is the way that emoji contribute to discourse.

As we note in Sect. 5, we acknowledge there are intriguing parallels between emoji and linguistic expressions of affect. Indeed, we suggest below that emoji share similarities with the class of expressions that Rett (2021a) calls emotive markers (e.g., *alas*). A related topic, and one that we largely leave for future work, is the relation between emoji and Potts' (2005, 2007) class of expressives (e.g., curse words, epithets, slurs, and honorifics). In the present work, we mostly look at emoji on their own terms, *sui generis*.

1.1 Project scope

Emoji can occur in a variety of positions (e.g., at the beginning, middle, or end of a sentence) and sentence types (e.g., declaratives, questions, imperatives). In the present work, we focus on single sentence-final emoji in declaratives. We investigate the use and interpretation of face emoji that are clearly positively or negatively valenced (e.g., 😊, 😞), and leave emoji with less clear valence (e.g., 😬, 😏, 😇) for future work. In what follows, we focus on '😊' as a good representative of the broader class of positive emoji (e.g., 😊, 😄, 😁, 😂): According to Emojipedia,

³ Independent of emoji, there exists a large literature on facial expressions, e.g., Tomkins and McCarter (1964), Ekman et al. (1972), Russell and Fernández-Dols (1997), Keltner and Cordaro (2017), inter alia. Furthermore, see also Weiß et al. (2020) for recent neuroimaging work on different responses elicited by emoji and actual human faces in a study on decision-making, and Fugate and Franco (2021) for a discussion of the mapping from facial expressions to face emoji in terms of so-called action units such as *lip corner puller* or *jaw drop* (Ekman and Friesen, 1978).

this emoji can be taken to convey “general pleasure.”⁴ Similarly, we investigate ‘😞’ as a representative of negative emoji (e.g., 😞, 😞, 😞, 😞). According to Emojipedia, this emoji can “convey a variety of moderately sad or tense emotions.”⁵ The happy and sad emoji that we investigate can be viewed as representatives of positive vs. negative emotions, i.e., members of a larger family of affective states. In what follows, we explore single occurrences of these kinds of clearly-valenced emoji in sentence-final position, in contexts where, roughly, the emoji seem to *comment on* the accompanying text.⁶

This question of what it means for an emoji to ‘comment on’ the text is the core issue that we tackle in the present paper. Intuitively, it is clear that emoji are linked in some way to the text that they occur with. What is the nature of this relation? Consider the examples in (2). (These examples, like the others in this paper, should be construed as text messages or social media posts.) Here, the intuition is that the emoji comments directly on a specific individual (2a), object (2b) or proposition (2c). In (2a), the emoji is naturally interpreted as expressing the author’s affective attitude regarding the individual denoted by ‘that guy’ (or perhaps on what ‘that guy’ did), and in (2b), the object denoted by ‘that fried chicken sandwich.’ In (2c), the sad face comments on the proposition ‘Alex hates spaghetti.’ (We use the term ‘author’ as we are dealing with the written modality; this parallels the expression ‘speaker.’)

- (2) a. Did you see that guy? 😞
 b. That fried chicken sandwich they make. 😞
 c. Alex hates spaghetti. 😞

However, there are also cases where the emoji does not comment directly on the text. Consider (3)–(4). In (3), the emoji seems to be providing information about the author’s feelings/attitude towards the recipient of the message,⁷ rather than commenting on an individual or proposition expressed (or presupposed) by the text. Similarly in (4), the emoji seems to comment on the current situation, rather than any particular linguistically-realized component. Here, the interpretation of the emoji is essentially independent of the interpretation of the text, and any connection between them stems from general (Gricean) pragmatic reasoning. We emphasize that these kinds of sentences are not the main focus of this paper: our aim is to better understand the nature of the emoji-text relation when the emoji comments on the text in a direct way.

⁴ <https://emojipedia.org/grinning-face/>.

⁵ <https://emojipedia.org/worried-face/>.

⁶ Although we focus on single emoji, it is well known that they can be repeated (e.g., Gawne and McCulloch, 2019). This property of emoji is predicted under an analysis that treats them as expressive-like, an idea that we explore in Sect. 5. For example, Potts (2007) analyzes repeatability (which is linked to intensification) as a property of linguistic expressives (e.g., *Damn, I left my damn keys in the damn car*). See also Sect. 3.5 of this paper for further discussion.

⁷ See Maier (2021: 26) for an analysis of the facial expression *smile* in uses where it expresses an emotive attitude towards the interlocutor.

- (3) How did the interview go? 😊
 (4) How are you coping? 😞

It's worth noting here that affective information expressed by face emoji is (by default) **author-oriented** (see Rett, 2021a, 2021b on miratives and Harris and Potts, 2009 on expressives, i.a.). As illustrated in (5), there is a strong preference to construe the emoji as reflecting the affective state of the author of the message, even though the sentences contain several other candidate attitude-holders. (For experimental data on the default author-orientation of emoji, as well as information about when emoji can shift away from the author, see Kaiser and Grosz, 2021).

- (5) a. Kate said Sue called Ann. 😊 ⇒ the author is happy
 b. Kate said Sue called Ann. 😞 ⇒ the author is sad

As will become clear in Sects. 3 and 4, the author-oriented nature of emoji is captured in our analysis by our proposal that the denotations of emoji hold between a person (the author), a target proposition, and the current discourse values of the *author*.

In the kinds of configurations that we investigate, the information that emoji contribute about affective attitudes is typically *not-at-issue* (see Potts, 2015; Beaver et al., 2017), so not available for explicit denial. For example, C's response to A in (6) is infelicitous, because that response is trying to deny the information conveyed by the emoji (that the author is happy), which is not-at-issue. (See Sect. 3.5 for details about how our proposed formal analysis captures the not-at-issue status of emoji.)

- (6) A: I just woke up. 😊
 B: That's wonderful! // C: #No. You're grumpy AF.

We acknowledge that metalinguistic/'presentational' uses of emoji, as in (7), can seemingly promote the information contributed by the emoji to at-issue status (see also Ebert and Ebert, 2014 on gesture).⁸ An attested (Twitter) example of this kind of at-issue use is given in (8). However, in the present paper, we do not investigate these kinds of uses.

- (7) A: I just woke up like this: 😊
 B: That's wonderful! // C: No. You're grumpy AF.

⁸ Examples like (7) and (8) suggest that at-issue interpretations involving emoji may be related to the presence of particular expressions such as *this* and *like*. We leave the precise source of the at-issueness in such contexts as a question for future work; see also Forbes' (2006: Ch. 8) discussion of *so*.

- (8) You know when you see something that makes you think of someone and go to send it but you don't speak anymore so you're just like 😊😞

1.2 Methodology: assessing infelicity

We use the hash mark (#) to indicate that a text and emoji combination is infelicitous, as illustrated in (9b). Absence of # indicates a felicitous combination.

- (9) a. I was really looking forward to today's picnic and now it's raining! 😞
 b. #I was really looking forward to today's picnic and now it's raining! 😊

Importantly, use of # does *not* mean that the example can never be judged felicitous. For example, there are cases where (9b) is perfectly fine, provided we apply some *mental gymnastics*: for example, perhaps the emoji is to be interpreted ironically, or perhaps the author is a person who, for whatever reason, loves picnicking in the rain. Indeed, cases where an emoji seems unexpected based on default world knowledge can trigger extra inferences as shown in (10). Here the comprehender tries to 'repair' a potentially odd text-emoji pairing by making an inference about the preferences of the author that could explain their use of the happy emoji. The inference that the author likes picnicking in the rain is possible but unexpected, based on world knowledge. In these kinds of special contexts, (9b) is not infelicitous.

- (10) I was really looking forward to today's picnic and now it's raining! 😊
 ⇒ *The author likes picnicking in the rain*

The idea that certain examples feel 'incoherent' and require more reasoning and effort than normal has a precedent in existing linguistic work. For example, (11b) feels incoherent, especially in comparison to (11a), but readers can engage in additional inferencing to try to make sense of (11b) (see e.g., Jurafsky and Martin, 2020 for discussion).⁹

⁹ To give one more example where extra inferencing of this type is needed, *Michael* is preferentially a male name in English, but the main character of the fictional *Star Trek: Discovery* is a woman called *Michael*. When judging (a) 'out of the blue', a reader unfamiliar with this TV series may assign a hash mark to (a).

a. Michael pulled herself up onto her elbow.

Example from <https://books.google.com/books?id=kWVnDwAAQBAJ>.

- (11) a. Jane took a train from Paris to Istanbul. She had to attend a conference.
(Jurafsky and Martin, 2020)
- b. #John took a train from Paris to Istanbul. He likes spinach.
(Hobbs, 1979)

We focus on readings that are accessible *without* excessive repair strategies or mental gymnastics. In what follows, we use # for text-emoji pairings that trigger an inferential search or reasoning process, requiring extra assumptions that go beyond the most ‘vanilla’ world knowledge base or what is already common knowledge.

We use these judgements of felicity and infelicity as our basic source of data. In the present work, our goal is to supply a simple theory of discourse, along with a semantic analysis of the happy and unhappy emoji themselves that help predict these judgments.

It is important to begin by acknowledging that formal semantics research on emoji is a new field, which naturally raises questions concerning the sources of the data and the nature of the judgments. The present paper uses mostly constructed examples, but our work is informed by corpus patterns as well. Importantly, existing research suggests that while people can differ in their degrees of emoji literacy/fluency, frequent emoji users have reliable introspective intuitions on emoji use. (For the term *emoji literacy*, see Danesi, 2016, whereas *emoji fluency* or *emoji language fluency* is employed by Neil Cohn and his Visual Language Lab, e.g., Thamsen, 2019; van Leiden, 2019.) While there are attested differences due to gender and age (Herring and Dainas, 2020), emoji are processed systematically (Weissmann and Tanner, 2018). Furthermore, the validity of emoji users’ judgments is further corroborated by psycholinguistic studies showing that researchers’ introspective intuitions on emoji are confirmed in controlled experiments. This is shown, for example, by the experimental data reported in Kaiser and Grosz (2021) for intuitions in Grosz et al. (2021). Indeed, the existence of reliable intuitions regarding emoji echoes findings in the purely linguistic domain. For example, work on experimental syntax confirms that introspective judgments are meaningful (see e.g., Sprouse & Almeida’s, 2012, 2013 on the validity of introspection in traditional linguistics).

In what follows, we provide semantic representations of the meaning contributed by emoji, rather than attempting to provide naturalistic ‘linguistic paraphrases’ of emoji meaning. Although there may sometimes seem to be loose equivalences between emoji (😞) and natural language expressions (e.g., *it’s upsetting me*), as in (12),¹⁰ many digital natives feel emoji cannot, in fact, be satisfactorily paraphrased in words—i.e., they are *ineffable* (see also Potts, 2005, 2007; Blakemore, 2011 for similar claims regarding linguistic expressives. See also Grosz (2022) for related

¹⁰ A version of the paraphrase “*it’s upsetting me*” was suggested by Masha Esipova (2021 correspondence).

discussion).¹¹ Following this, we assume that, at least in the vast majority of cases, linguistic paraphrases cannot be truly parallel to emoji.

- (12) I'm so hungry 😞
 ↷ I'm so hungry, it's upsetting me!

1.3 The analysis in a nutshell

In this section we briefly preview key aspects of the analysis of text-emoji messages that we present in this paper. We assume that emoji are part of multi-modal discourse and interact with text. In particular, they contribute information about participants' affective attitudes towards propositions that are expressed by linguistic components of the discourse. We propose that emoji comment on a target proposition, but only do so in light of the way that proposition bears on a salient value, priority, or goal held by the author of the message. We refer to the author's salient value (i.e. a possible state of affairs that the author desires, aspires to, wishes for, or hopes for) as a **discourse value**.

In short, we propose that there are three key interpretive forces at work in the discourse contribution of a text-emoji message: (i) the linguistic content of the text (the target proposition), (ii) the affective content of the emoji, and (iii) a discourse value held by the author.

A preview of our value-based analysis is given in (13), capturing how an emoji-based evaluation of a target proposition p is connected to a contextually salient value v of the author x .¹² Crucially, we embed this analysis in a discourse dynamics (Sect. 3.5) that handles the conversational impact of a combination $S^{\wedge}E$ consisting of an assertive discourse segment S and an affective face emoji E . After S makes its standard discourse contribution (e.g., adding its content to the common ground in example [12]), E operates on a target proposition p , which is expressed or presupposed by S , thereby triggering the search for a discourse value v . (As we explain below in (21) and (22), E can target S or a subpart of S .) E then conveys that the author has an affective attitude A (*happy* or *unhappy*) towards how p supports (in the happiness case) or hinders (in the unhappiness case) the attainment of v .

¹¹ In an Emoji Usage Questionnaire administered to pre-adolescents by Sick et al. (2020: 8), more than half of the 254 participants selected the following motivation for using emoji: "they express something that normally cannot be described in words."

¹² The (meta-)linguistic paraphrases in the lexical semantics are shorthand for the actual complexity of emotive meaning that is conveyed by and encoded in an emoji; we do not intend *is happy* or *is unhappy* in the metalanguage to be equivalent to the natural language expressions, and we do not intend the corresponding natural language expressions to fully capture the emoji meaning (see also discussion above regarding emoji's ineffability).

- (13) *Value-based approach to emoji semantics (preliminary)* For an author x , target p , and value v :
- i. $[[\text{😊}]] = \lambda x \lambda p \lambda v. \{w \mid x \text{ is happy about how } p \text{ bears on } v \text{ at } w\}$
 - ii. $[[\text{😞}]] = \lambda x \lambda p \lambda v. \{w \mid x \text{ is unhappy about how } p \text{ bears on } v \text{ at } w\}$

The value-based view is attractive and parsimonious for the theory-independent reason that values have long been shown to play a central role with regards to affect and its expression (see Ortony et al., 1988).

2 The targets of emoji

2.1 Core definitions and hypothesis space

The aim of Sect. 2 is to provide initial evidence for an analysis where face emoji can comment on a proposition provided by the accompanying text. To begin with, examples like (14) give rise to the intuition that there is some connection between the face emoji (😞) and the accompanying text (*I'm hungry!*); what is unclear is how this connection is best characterized.

- (14) I'm hungry! 😞

To map out the relevant hypothesis space for emoji-text interactions, we compare two possible analyses, which we pre-theoretically dub **independence**,¹³ (15), and **dependence**, (16). In these two examples, (15ab) and (16ab) are identical, as these are the object language expression and the contribution of the text, respectively. Here, the author asserts the proposition *the author is hungry*, which is then added to the Common Ground (CG), the set of propositions that are mutually accepted by the interlocutors (i.e. the author and the readers).

The **independence analysis** is illustrated in (15cd): the emoji contributes affective information that does not comment on the accompanying text, (15c). Instead, it simply communicates a general emotive state that holds in the context ('I am upset right now'). This means that any perceived interaction(s) between the emoji and the text are indirect, as shown in (15d), presumably based on standard pragmatic reasoning (see e.g., Grice, 1989, 2001).

- (15) *Independence analysis*
- a. I'm hungry! 😞
 - b. "I'm hungry" asserts $p = \text{author is hungry}$ and adds p to CG
 - c. 😞 conveys *author is upset*

¹³ Note that our notion of *independence* is distinct from what Potts (2007: 167–169) calls 'independence' in his discussion of expressive meaning, which amounts to the idea that expressive content is on a different semantic dimension from truth-conditional meaning. This entails that expressive elements cannot impact the truth conditions of an utterance that contains them (see also Gutzmann, 2013: 37), which sets them apart from presupposition triggers, as the latter can give rise to an undefined truth value (see e.g., Beaver et al., 2021).

- d. **interaction:** addressee draws the conclusion (based on pragmatic reasoning) that the author's irritation (15c) is connected to the author being hungry (15b)

The **dependence analysis** is illustrated in (16cd). Here, the emoji contributes affective information that comments on the accompanying text in (16c). Under such an analysis, the interactions between the emoji and the text are direct/semantic in (16d).

(16) *Dependence analysis*

- a. I'm hungry! 😞
 b. "I'm hungry" asserts $p = \text{author is hungry}$ and adds p to CG
 c. 😞 comments on "I'm hungry" and conveys *author is upset about being hungry*
 d. **interaction:** [😞] takes a p argument (possibly via an anaphoric relation rather than a syntactic relation) and comments on p as its subjectmatter of emotion

Crucially, we will not argue that *all* emoji uses should be analyzed as dependent, but we argue that *at least some* emoji uses require a dependence analysis in the spirit of (16). This is not a trivial claim, as independence is simple and economical, and thus functions as the null hypothesis.

Before moving on to the empirical evidence in Sect. 2.2, we introduce one more piece of key terminology: for all dependence cases, we use the term **target (of the emoji)** to refer to the proposition that the emoji comments on, such as p in (16d), roughly amounting to the cause of the emotion.¹⁴ In what follows, we focus on

¹⁴ In the linguistics literature, terminological questions have been raised in relation to the observation that psych predicates such as *be angry* can interact with more than one entity, such as the preposition phrases *with Bill* and *about the party* in (a). Pre-theoretically, both could be labeled 'objects of emotion'. Pesetsky (1995: 55) introduces the terms 'subject matter of emotion,' roughly corresponding to the cause of the emotion (*the party*), and 'target of emotion,' an entity that is positively or negatively evaluated (*Bill*).

- a. Sue is angry with Bill about the party. (stylistically adapted from Pesetsky, 1995: 63)

Our notion of *target (of the emoji)* largely corresponds to the 'subject matter' (which is typically propositional), and not to Pesetsky's 'target of emotion' (typically an individual). That being said, we remain agnostic as to whether emoji can also be used to directly evaluate an individual. Example (b) seems to be ambiguous between a positive evaluation of the referent of *that guy* (Pesetsky's 'target') as opposed to a positive emotion towards a proposition that involves that referent (Pesetsky's 'subject matter').

- b. Did you see that guy? 😊

propositional targets, leaving open whether face emoji can also comment on non-propositional targets.¹⁵

In Sect. 2.2, we proceed to argue that dependence cases exist, and that we thus require a dependence analysis of emoji-text interaction.

2.2 Evidence for *semantically encoded* emoji-text interactions

Within the scope of this paper, we take it for granted that some cases of text-emoji independence may exist. A candidate for independence is given in (17), a text-emoji combination for which several tokens are also found on Twitter; this is a natural message to send discourse-initially if the author knows that the addressee is going through a difficult time. In this example, the emoji plausibly does not comment on the question “How are you doing?”; instead, it seems to convey that the author empathizes with the addressee on a more general level.¹⁶

- (17) a. How are you doing? 😞
 b. 😞 \leadsto the current situation makes me sad (i.e., I empathize with you for being in it)
 (\neq how you are doing makes me sad)

While we thus explicitly allow for the existence of independence cases, our aim is to provide compelling evidence for the claim that there exist emoji-target relations that are best accounted for by means of the dependence analysis: in other words, cases that involve a semantically encoded emoji-text interaction. More specifically, we propose that a version of the *Simple Targeting* hypothesis in (18) can be maintained for such semantically encoded emoji-text interactions. (The simple targeting view is closely related to Rett’s (2021a) proposal for expressives such as *wow* or *alas*. We take these expressives to be the closest counterparts of face emoji in natural language. See Sect. 5 for a more detailed comparison.)

¹⁵ Note that our approach is in line with Rett (2021a) (see Sect. 5), who argues that emotive markers (e.g., *unfortunately*, *alas*) attach to propositional constructions. Future developments include an extension of our analysis in terms of polymorphic types, where the semantic type of an emoji depends on its target, which could be a proposition ($p = \text{that the mistake happened}$), individual ($x = \text{the mistake}$), etc., see Asher (2011, 2014), among many others.

¹⁶ An alternative analysis of (17) would be that the emoji comments on the expected answer “not well,” but this does not strike us as the most natural interpretation of this particular example. Variants of (17) that make the same point (and also repeatedly occur on Twitter) are given in (a) and (b) below, where (b) involves text in the shape of a declarative.

- a. Are you ok? 😞
 b. I hope you’re ok. 😞

(18) **Simple Targeting**

- i. An emoji's target must be a proposition *put into play* by the emoji-accompanying clause.
- ii. In the case of multiple clause candidates, pragmatics disambiguates.

In (18i), we use the term *put into play* in a theory-neutral way to capture the observation that an assertoric sentence makes both the asserted proposition and its presuppositions accessible for an emoji. This is shown in example (19), where the emoji comments on the presupposition *I am not there*.¹⁷

- (19) *Context: My friends send me a photo from a party that they are currently at.*
- a. I wish I were there. 😞
 - b. 😞 \leadsto I am sad *that I am not there*
(\neq I am sad that I wish to be there)

Similarly, a question puts its presuppositions into play quite prominently, so that (20a) has the reading in (20b), where the emoji comments on the presupposition of the question.

- (20) a. Who drank my coffee? 😞
- b. 😞 \leadsto I am sad *that someone drank my coffee*

To illustrate (18ii), consider the examples in (21) and (22). This is a case where the emoji-accompanying text involves clausal embedding. As shown by the apparently divergent emotions (negative in [21] vs. positive in [22]), an emoji can comment on the entire clause (or matrix clause), as shown in (21), but it can also comment exclusively on the embedded clause, as shown in (22). Here, *E* is a place-holder for the emoji that occurs in the text to be analyzed.

- (21) a. Nobody told me that today is a holiday. 😞
- b. *E* comments on $p = \textit{nobody told me that today is a holiday}$

- (22) a. Nobody told me that today is a holiday. 😊
- b. *E* comments on $p = \textit{today is a holiday}$

¹⁷ We are grateful to Dorit Abusch for raising the point that it is controversial whether the inferences in (19) and (20) are presuppositions or implicatures. Since this issue is not central to our discussion, we leave this question open for further research. For a recent discussion of the presuppositions of counterfactual wishes, (19), we refer the reader to von Stechow and Iatridou (2020). The idea that *wh*-questions have an existential presupposition, (20), can be traced back to Katz and Postal (1964) and Keenan and Hull (1973).

We can now turn to our first two case studies, which corroborate the proposal that we outlined so far. Our first case study (Sect. 2.2.1) provides evidence that face emoji connect to the immediately preceding sentence; our second case study (Sect. 2.2.2) further corroborates this point by showing that the face emoji are sensitive to the actual phrasing of the preceding sentence.

2.2.1 Case I: *The Hunger*

To show that emoji interact with the text that accompanies them, we start by looking at constraints on the positioning/ordering of the emoji with regards to the text. The logic of the argument can be stated as follows: The order of emoji and text should have minimal impact on the interpretation of emoji if the emoji just convey a general emotive state that holds in the context (such as ‘I am happy right now’ or ‘I am unhappy right now,’ as would be the case under an independence analysis). Yet, we find that relative position/ordering strongly impacts the interpretation of the emoji. Therefore, we conclude that emoji are not interpreted in a way where they express general happiness or unhappiness in the context; instead (in line with our proposed dependence analysis) emoji interact with text, and linguistic factors (e.g., surface adjacency to the propositional target) play an important role.

The setup in example (23) can be described as follows. A non-negatively valenced statement (“just ordered some food”) is preceded by a negatively valenced one (“I’m really hungry”). Since the author’s actual situation (access to food) does not change between the two sentences, a negative emotion (😞) should be licensed throughout if it were to purely reflect the author’s overall (holistic) affective state; this is what would be predicted by the independence analysis. By contrast, our test example shows that the critical (23b) is infelicitous, even though the affective state presumably remains the same throughout. The infelicity of (23b) is explained if we assume the simple targeting hypothesis in (18).

- (23) a. I’m really hungry 😞 just ordered some food.
 b. #I’m really hungry, just ordered some food. 😞

To see how the asymmetry between (23a) and (23b) provides evidence in favor of simple targeting, we can spell out the consequences of simple targeting in (24) and (25). If the emoji preferentially comments on the immediately preceding clause, then we derive the contextually appropriate inference in (24b).

(24) Simple-Targeting-based analysis of (23a)

- a. I’m really hungry 😞 just ordered some food.
 b. *E* comments on p = *the author is really hungry* and conveys that p is bad

For the message-final emoji, (23b), there are two conceivable propositions the emoji can target, in line with our discussion in (21)–(22). On a “narrow scope”

reading,¹⁸ the emoji comments only on the proposition conveyed by the immediately preceding clause (*just ordered some food*), giving rise to the contextually inappropriate inference in (25b), which explains the infelicity of (25a) (= [23b]) under such a reading.¹⁹ A “wide scope” reading, (25c), is possible if an author/reader intends the two clauses to be implicitly conjoined, and the emoji comments on this conjunctive proposition. An ambiguity between (25b) and (25c) is predicted by our analysis (modulo the plausible assumption of implicit conjunction in [25c]), as this difference would be equivalent to the difference between (22) and (21). A reader may now wonder if (25c) is as inappropriate as (25b); we argue that it is, since (26) shows that the same message with overt conjunction (*and*) is equally unacceptable.²⁰ The inappropriateness of (25c) (via [26]) thus explains the infelicity of (25a) (= [23b]) under a “wide scope” reading.²¹

¹⁸ We use the terms “narrow scope” and “wide scope” as mnemonics only, and thus place them in quotation marks. They are not meant to imply syntactic scope, since we assume that the emoji accesses its target proposition *p* by virtue of an anaphoric relationship.

¹⁹ A reader may wonder whether (23ab) could be explained in terms of discourse relations, where the emoji is connected to the text by virtue of the discourse relation RESULT (see Lascarides and Asher, 1993; Jasinskaja and Karagjosova, 2020). Such an approach is spelled out in (a).

- a. RESULT(I'm really hungry, 🍔)
= The eventuality described by “I'm really hungry” caused the state described by “🍔”.

While Grosz et al. (2021) propose that discourse relations are, in fact, involved in the interpretation of non-face emoji (🍔, 🍷), we do not pursue such an approach for face emoji, our reasons being the following: on the one hand, while combinations of text and non-face emoji exhibit variation in the discourse relations that connect them, we do not seem to find such variation in how face emoji relate to the preceding text. In other words, all combinations of text and face emoji would require the RESULT discourse relation, an unexpected lack of variation. On the other hand, it is difficult to see how an analysis based on discourse relations would handle examples with questions such as our example (20). That being said, a RESULT-based analysis would not be entirely incompatible with our theory, as it would still entail a form of dependence between the text and the emoji, though that dependence would be different from what we propose. A further investigation of such an approach is beyond the scope of this paper.

²⁰ We are grateful to an anonymous reviewer for suggesting (26) and the relevant intuition to us.

²¹ As a reminder, (23b) improves if we apply additional reasoning (mental gymnastics), as in (b).

- b. Context: *I'm on a very tight budget and the thing I really dislike most is to order food.*
I'm really hungry, just ordered some food. 🍔

(25) **Simple-Targeting-based analysis of (23b)**

a. #I'm really hungry, just ordered some food. 😞

b. **“narrow scope” reading***E* comments on $p =$ *the author just ordered some food*, and conveys that p is bad.c. **“wide scope” reading (with implicit conjunction)***E* comments on $p =$ *the author is really hungry and just ordered some food*, and conveys that p is bad.

(26) #I'm really hungry and just ordered some food. 😞

We can thus conclude that simple targeting explains the infelicity of (23b) and its difference from (23a), which does not follow from an independence analysis where emoji convey a general emotive state (such as ‘I am unhappy right now’ or ‘I am happy right now’). This point is further strengthened by looking at (27a), a variant of (23b) where the positive 😊 has been substituted for the negative 😞. If we switch the two preceding clauses, as in (27b), we observe that the positive emoji becomes infelicitous, another ordering effect that parallels (23b); the acceptable (27c) (without any emoji) shows that the reversed order of sentences is not unacceptable in itself.

(27) a. I'm really hungry, just ordered some food. 😊

b. #just ordered some food, I'm really hungry. 😊

c. just ordered some food, I'm really hungry.

2.2.2 Case II: *The Game*

While we will maintain that simple targeting provides the best explanation of the cases considered thus far, we now proceed to problematize such a simple proposition-based analysis, which highlights the need for also considering the discourse values of the author as foreshadowed in Sect. 1.3. The core finding of our second case study is that the presentation of equivalent facts (e.g., “a 50% chance of A” vs. “a 50% chance of $\neg A$ ”) with different lexical items affects the acceptability of a positive (😊) vs. negative (😞) emoji, in ways quite reminiscent of the framing effects first discussed by Tversky and Kahneman (1981) (see Geurts, 2013 for a recent semantic analysis; see also Berto and Nolan, 2021 on related issues).

To begin with, consider our first observation, in (28) and (29). What these examples show is that emoji appear to not just comment on the proposition conveyed by the preceding text; instead, they are influenced by lexical material contained in the preceding text, such as the choice between the predicate *win* and its antonym *lose*. Let us start by highlighting the context. In a contest in which there are no ties, and not winning is the same as losing, the statements in (28ab) and (29ab) are all truth-conditionally equivalent: they describe one and the same set of situations, i.e. one and the same proposition.

Nevertheless, the distribution of the positively valenced emoji 😊 is asymmetric, in that it is acceptable with *win* in (28a) and unacceptable with *lose* in (28b). Moreover, the distribution of the negatively valenced emoji 😞 in (29ab) is its exact mirror image. (Examples [28]–[32] assume that the author and addressee have no strong prior expectations about the chance of winning or losing before the message is sent. We briefly address an example with prior expectations in [33].) In the remainder of our paper, we argue that the observed contrasts are in fact not tied directly to specific lexical items, such as *win* or *lose*, but rather are connected to framing effects that emerge from the choice of a given lexical item (*win* vs. *lose*). These framing effects are addressed more explicitly in example (34) at the end of this section.

(28) *Context: We're watching college football; there are no ties; not winning equals losing.*

- a. There's a 50% chance we'll win. 😊
- b. #There's a 50% chance we'll lose. 😞

(29) *Context: We're watching college football; there are no ties; not winning equals losing.*

- a. #There's a 50% chance we'll win. 😞
- b. There's a 50% chance we'll lose. 😊

It is worth pointing out that the assumption of truth-conditional equivalence of (28ab) and (29ab) depends on an *exactly* reading of 50%, as opposed to an *at least* reading. We follow Kadmon (2001), Bultnick (2005), Ariel (2006), and Breheny (2008), among others, in maintaining that the lexical semantics of numerals (such as 50) does in fact amount to an *exactly* reading.²²

The patterns in (28)–(29) show that the emoji are sensitive to how the facts are presented. Even more strikingly, the addition of the exclusive particle *only* reverses the judgments, as shown in (30) and (31).²³ If *only* is added to the acceptable (28a), the resulting (30a) is infelicitous; by contrast, if *only* is added to the infelicitous (28b), the resulting (30b) is acceptable. This is similar to the findings of Ducrot (1974: 272–273)

²² Under such a view, *at least* readings are pragmatically derived, e.g., by virtue of pragmatic slack, as discussed by Lasersohn (1999), Lauer (2012), among others. See also Breheny (2008) for further analysis in this spirit.

²³ Note that the observation that *only* reverses the patterns is entirely compatible with our assumption that (28) and (29) involve an *exactly* reading of 50. Examples like (a) and (b) show that the impact of *exactly* and *only* are not equivalent. In (b), *only* typically triggers an inference that Alex was expected to be taller (due to a *scalar lowness* inference that often emerges with *only*, cf. Guerzoni, 2003; Klinedinst, 2005: 12; Grosz, 2012: 226); such an inference is missing from the statement with *exactly* in (a).

- a. Alex is exactly 5'3" tall.
- b. Alex is only 5'3" tall.

for French *seulement* ‘only’, as applied to English *only* by Winterstein (2011): that *only* reverses “the orientation of its prejacent” (Winterstein, 2011: 2).

(30) *Context: We’re watching college football; there are no ties; not winning equals losing.*

- a. #There’s only a 50% chance we’ll win. 😊 (reverses [28a])
 b. There’s only a 50% chance we’ll lose. 😊 (reverses [28b])

(31) *Context: We’re watching college football; there are no ties; not winning equals losing.*

- a. There’s only a 50% chance we’ll win. 😞 (reverses [29a])
 b. #There’s only a 50% chance we’ll lose. 😞 (reverses [29b])

We can state the key insights from this second case study (The Game) as follows: First of all, the asymmetry in truth-conditionally equivalent emoji-text pairs, (28ab) and (29ab), further corroborates simple targeting in the sense that emoji comment on the text. However, emoji acceptability is affected by framing based on linguistic material (such as the choice of *win* vs. *lose*, or the addition of *only*) in a way not predicted by simple targeting as defined in (18). Note that the intuitions in examples (28)–(31) have been corroborated by experimental findings in Bjertnes (2022). In Sects. 3 and 4, we proceed to argue that these asymmetries can be explained by adding context-sensitivity to the meaning of emoji.

Importantly, note that the percentages themselves in our examples do not seem to matter. The overall facts remain the same if we tilt the percentages in one direction or the other (e.g., 70–30% or 90–10%), as summarized in (32) for two extreme scenarios: 10% winning and 90% winning, respectively. However, as we will see in (33), the prior assumptions of a reader (which are not included in these examples) do affect the acceptability of a given emoji.²⁴

(32) *Intuitions in a scenario with an asymmetric probability of winning vs. losing*

- a. There’s a {10% / 90%} chance we’ll win. 😊
 b. #There’s a {10% / 90%} chance we’ll win. 😞
 c. #There’s only a {10% / 90%} chance we’ll win. 😊
 d. There’s only a {10% / 90%} chance we’ll win. 😞

²⁴ To complete the paradigm in (32), (a) shows that the examples with *lose* pattern alike.

- a. *Intuitions in a scenario with an asymmetric probability of winning vs. losing*
 i. #There’s a {10% / 90%} chance we’ll lose. 😊
 ii. There’s a {10%/90%} chance we’ll lose. 😞
 iii. There’s only a {10%/90%} chance we’ll lose. 😊
 iv. #There’s only a {10%/90%} chance we’ll lose. 😞

A central intuition with regards to (32a) is that any non-zero chance of winning could give rise to the ultimate goal of winning. Regardless of whether our chance is calculated to be *exactly 10%*, *exactly 50%* or *exactly 90%*, each of these could serve as a *mediating outcome* that promotes the *final outcome* where we win; by contrast, a 0% chance of winning would not be a mediating outcome for the same final outcome. The notions of mediating and final outcome (and how they interact with *only* in [32d]) will be operational in deriving the (un)acceptability of the core examples in this paper. Both notions are formally defined in Sect. 4.1, and applied to the paradigm in (28)–(31) in Sects. 4.2–4.3.

As mentioned above, (28)–(32) are evaluated in a neutral context without strong prior expectations. Crucially, changing the scenario to one where the prior expectation is higher than the stated probability—for instance, 95%—the judgments flip even in the absence of *only*. This is illustrated in (33a), which behaves like (32c) (and [30a]), versus (33b), which behaves like (32d) (and [31a]). Note that (33ab) seems quite natural with the addition of *actually*, indicating a contrast between what is said and what was expected, see Aijmer (2013: 74–126).

(33) *Context: We're watching college football; there are no ties; not winning equals losing. Our expectation was that we have a 95% chance of winning. Our friend Mel, a maths genius, does some calculations, and texts the following:*

- a. # (Actually,) there's a {10%/50%/90%} chance we'll win. 😊
 b. (Actually,) there's a {10%/50%/90%} chance we'll win. 😞

Wrapping up this discussion, the facts in The Game intuitively seem to be a reflection of different questions that an author is addressing, as shown by (34ab) vs (34cd). Essentially, the author and reader hope that it is possible to win; moreover, they also hope that winning is likely. In the Game examples that we have seen, the positive emoji tends to occur with affirmations of possibility, (34ab), whereas the negative emoji tends to occur with the denial of likelihood, (34cd). This contrast forms the basis of the analysis we develop in Sects. 3 and 4. However, our analysis views the observed effects as an epiphenomenon of something more fundamental to the understanding of emoji: the role of **discourse values**, which embody what an author desires, aspires to, wishes for, or hopes for.

(34) *Introducing the discourse context into emoji discourse*

- a. Q1 = Is it **possible** for us to win?
 A1a: (**Yes.**) There's a 50% chance we'll **win**. 😊
 b. Q1 = Is it **possible** for us to win?
 A1b: (**Yes.**) There's **only** a 50% chance we'll **lose**. 😞
 c. Q2 = Are we **likely** to win?
 A2a: (**No.**) There's a 50% chance we'll **lose**. 😞
 d. Q2 = Are we **likely** to win?
 A2b: (**No.**) There's **only** a 50% chance we'll **win**. 😞

Before venturing into the analysis, we can draw intermediate conclusions from our discussion so far. Our first case study (The Hunger) argues that at least some uses of emoji require a ‘dependence’ approach to emoji, where emoji-text interaction is semantically encoded and emoji target the proposition expressed by the emoji-accompanying clause. Our second case study (The Game) gives rise to the reasonable assumption that the phenomenon is more complicated than communicating affective information about the proposition (set of situations) expressed by the accompanying text. Here, we have seen asymmetry where symmetry was expected. Our core question can thus be posed as follows: What is the role of lexical material (e.g., *win/lose* and the addition of *only*) and the surrounding context in licensing positive/negative evaluation by an emoji?

In Sect. 3, we propose a more nuanced analysis where emoji target a proposition p provided by the accompanying text in a way that is relativized to the values/goals of the author. We propose the notion of discourse values to capture this relation.

3 Emoji, targets, and values

3.1 Values and emotions

So far we have argued that the semantic contribution of emoji to discourse is dependent on the propositions supplied by adjacent text. But we have also seen that this analysis, while illuminating, is too simple, and that emoji are sensitive to elements of context beyond the target proposition. In this section, we propose that emoji express affective attitudes about target propositions only relative to values or goals of the author that are at work in the discourse. We call these **discourse values**; they may include a wide range of desirable outcomes like *winning the game*, *satiating hunger*, *being happy*, *finishing the paper*, and so on.

The introduction of contextually determined discourse values to the overall analysis is motivated by the linguistic data, but it also complements decades of research on the psychology of emotions. Cognitive scientists have widely viewed emotions as involving cognitive states of **appraisal**, assessments of the degree of congruence between an agent’s values and the facts as they perceive them.²⁵ For example, as Ortony et al. (1988: 4) observe, fans of opposing teams may leave a basketball game with radically different emotions: joy on one side, despondence on the other. They share the same factual beliefs about what has occurred, but their emotions reflect divergent appraisals of these facts.

We understand such appraisals in terms of **values**: possible states of affairs which an agent is positively disposed towards. In the case of the basketball game, fans of

²⁵ See Lazarus (1991), Ortony et al. (1988), Scarantino and de Sousa (2018). Thanks to Matthew Stone for the suggestion that we could understand emoji meanings as relativized to values, as described in the appraisal theory of emotions.

Team 1 will have the value *Team 1 wins*, and fans of Team 2 will have the value *Team 2 wins*. Of course only one of these values is satisfied by the facts.

The class of values is intentionally broad, encompassing a wide range of tastes, goals, desires, aspirations, preferences, and normative commitments. To a first approximation, an agent experiences a **positively valenced emotion**, such as happiness, relief, or pride, only when one of their values is advanced or **promoted** by what they believe to be true in the current situation, and a **negatively valenced emotion**, such as sadness, disappointment, or shame, only when what they believe promotes the *negation* of one of their values.²⁶

For now, we will treat values themselves as propositions, albeit propositions that occupy a distinctive role in cognition.²⁷ In this section, we'll provisionally assume that a proposition promotes a value when it *entails* that value; in this case, we'll say the proposition **satisfies** the value. Thus the fact that 'Team 1 wins' satisfies the value *Team 1 wins*. We will likewise assume for now that a proposition promotes the negation of a value when it entails that value's negation; in this case, we will say the proposition **violates** the value. So the fact that 'Team 1 wins' violates the value *Team 2 wins*. These ideas will be refined as we proceed, and in Sect. 4 we'll introduce a more general notion of promotion that isn't limited to strict entailment.

Our contention in the remainder of this section is that a semantic theory of emoji must countenance values as a parameter of discourse. Just as emotions vary with values, so too do the inferences licensed by the use of emoji. The addition of values to discourse is not a radical departure from linguistic tradition, which has variously recognized the linguistic relevance of ordering sources (Kratzer, 1981/2012), discourse goals (Grosz and Sidner, 1986), extra-linguistic questions (Roberts, 2012: 7), judgements of taste (Lasersohn, 2005), and preference structures (Condoravdi and Lauer, 2011; Starr, 2020). We propose that conceptually analogous semantic objects play a role in the interpretation of emoji.

Sects. 3.2–3.4 motivate and informally articulate our value-based analysis. Sect. 3.5 provides a more formal statement.

3.2 Values and emoji in discourse

The elation of fans for winning teams and disappointment of those for losing teams highlights the psychological role of values in determining the valence of experienced emotions. The specifically linguistic role of values comes to the fore in cases where values vary even when author, target proposition, and other elements of the discourse context are held fixed. We propose that, when emoji are used, a value held by the current author is, or has been, made contextually salient in discourse. The salient discourse value is signaled through a combination of the

²⁶ More nuanced engagement with specific emotions may require more careful delimitations here.

²⁷ We assume that the relationship between agents and their values is a species of propositional attitude, but make no commitment about the substantive structure of such attitudes. For example, a number of authors have argued that verbs of desire require not just a parameter for an agent and proposition, but also an ordering source (or similarity ordering over worlds). For example, see Heim (1992), von Stechow and Iatridou (2005, 2008), Condoravdi and Lauer (2011, 2012).

emoji itself, its accompanying text, and background knowledge; we return to the question of how context determines discourse value in Sect. 3.4.

To illustrate the linguistic relevance of discourse values, consider the following pair:

- (35) *Context: We know it's going to rain Saturday. It's mutual knowledge that our friends Jack and Jim are getting married soon, but not when. In addition, we are both happy they are getting married. I text you:*
- a. Jack and Jim are getting married Saturday. 😊
 - b. Jack and Jim are getting married Saturday. 😞

Given the arguments in Sect. 2, we assume that the proposition that the emoji comments on is identical in both examples, i.e., the proposition that Jack and Jim are getting married on Saturday.

In (35a), we infer that the author conveys their enthusiasm about the wedding, regardless of weather. In (35b), we infer that the author conveys that they are unhappy about the fact that the wedding is on a rainy day, but *not* that they are unhappy in any way about the wedding itself. A theory of emoji should: (i) anticipate that (35a) and (35b) are both felicitous given normal assumptions about the author's attitudes towards weddings and weather, and (ii) account for the specific inference in (35b) to the effect that the unhappiness is driven by the rain, and not by the wedding itself.

These facts are not easily explained by a theory in which emoji meanings take only target propositions as arguments (along the lines of simple targeting defined in [18]), a point already anticipated at the conclusion of Sect. 2.2.2. To capture the acceptability of both (35a) and (35b), simple targeting would require us to accept primitively conflicting emotions about the same proposition, with no account of their apparent inconsistency.²⁸ And the different inferential potentials of the two discourses would be left entirely to unstructured pragmatic reasoning.

For now, the intuitive idea of discourse value is brought out by three general constraints. First, we assume that, in any context, the discourse value is one held by the author, rather than the addressee or other discourse participant.²⁹ Second, the discourse value is broadly relevant to the topic and goals of the present conversation. Third, it is expected that the discourse value is congruent (in a sense to be explained) with any explicitly stated values in the text of the message as well

²⁸ We recognize that genuinely **conflicting emotions** are possible, but we don't think they are the norm. Conflicting emotions arise when an agent has both positively and negatively valenced attitudes about the same proposition relative to the same value. Much more common are **mixed emotions**, where an agent has positively and negatively valenced emotions about the same proposition, but only relative to different values. For example, an author who wrote *both* (35a) and (35b) would be expressing mixed emotions.

²⁹ Under pragmatic pressure, this constraint is sometimes relaxed. For example, if a non-author individual is highlighted by context in the right way, then the emoji is interpreted as conveying the emotions of the individual under discussion rather than the author. Compare Potts (2007: 166), Amaral et al. (2007), and Harris and Potts (2009), on perspective shifting of expressives; more recently, Rett (2021a) on perspective shifting of emotive markers. See also Kaiser and Grosz (2021) who offer experimental evidence that perspective shifting with face emoji can be triggered by explicitly mentioning a non-author experiencer.

as with the emoji itself. Thus a reader may often infer the discourse value through a process of accommodation.

Semantically, we now view the affective attitudes which are the denotations of emoji as holding between the author, a target proposition, and a discourse value – as advertised in Sect. 1. We can capture this analysis schematically as follows:

(36) **Denotations for emoji**

- i. $\llbracket \text{😊} \rrbracket = \lambda x \lambda p \lambda v. \{w \mid \text{happy}(x, p, v) \text{ at } w\}$
- ii. $\llbracket \text{😞} \rrbracket = \lambda x \lambda p \lambda v. \{w \mid \text{unhappy}(x, p, v) \text{ at } w\}$

We develop a more detailed account of the discourse conditions required for the felicitous use of these emoji below. Roughly speaking, we understand the denotation of 😊 as a positively valenced emotion whose expression is licensed when the target proposition promotes the discourse value, and the denotation of 😞 as a negatively valenced emotion whose expression is licensed when the target proposition promotes the negation of the discourse value.

The introduction of discourse values offers a productive frame in which to understand the patterns highlighted in (35). In our analysis of (35ab), two different discourse values are brought into play by the two discourses. (35a) involves the author's positive valuation of Jack and Jim getting married. This is the value that is satisfied by the target proposition. (35b) involves the positive valuation of Jack and Jim getting married *along with* a positive valuation of the weather being good for the wedding. This is the value that is violated, in context, by the target proposition. So we may understand the variation of target and discourse value in (35) as follows:

- (35a) Jack and Jim are getting married Saturday. 😊
- target = *J&J are getting married Saturday*
 - discourse value = *J&J are getting married*

- (35b) Jack and Jim are getting married Saturday. 😞
- target = *J&J are getting married Saturday*
 - discourse value = *J&J are getting married on a sunny day*

The attentive reader will notice that the target in (35b) does not logically entail the negation of the discourse value, so falls short of the narrow definition of the violation (or satisfaction) of a value in terms of logical entailment outlined in Sect. 3.1. The target in (35b) only entails the negation of the discourse value in conjunction with the background knowledge that it will rain on Saturday. In the next section we move to expand our definition of violation and satisfaction to incorporate this kind of contextual entailment.

3.3 Satisfying discourse values in context

In the preceding discussion we assumed a role for context in mediating the satisfaction of values by targets. We now turn to clarify this relationship, starting with the following case:

- (37) *Context: The author and Carlotta are the finalists competing for a scholarship, which exactly one of them will receive. The author and Carlotta are close friends.*
- a. Carlotta got the scholarship. 😊
 - b. Carlotta got the scholarship. 😞

Here we infer that the author of (37a) is happy *for Carlotta* that Carlotta won the scholarship, while the author of (37b) is unhappy *for themselves* that Carlotta won the scholarship. Thus the case once again involves alternation between two competing values.

The analysis of (37a) is straightforward. The author values Carlotta winning, and she won; the use of 😊 expresses the happy consilience of value and fact. (37b) is less direct: the author values their own winning, but the fact that Carlotta won implies, in context, that this value is violated. The use of 😞 expresses unhappiness at the contextually implied violation of this value.³⁰

- (37a) Carlotta got the scholarship. 😊
- target = *Carlotta wins*
 - discourse value = *Carlotta wins*
- (37b) Carlotta got the scholarship. 😞
- target = *Carlotta wins*
 - discourse value = *Author wins*

What we have to capture now is the idea that a target may satisfy a value or not, *relative* to the interlocutor's shared background knowledge or **common ground** (Stalnaker, 2002). We initially characterized value satisfaction as entailment of the value by the target proposition: to incorporate the inferential role of background knowledge, a natural extension is to make use of contextual entailment. Let “[CG after p]” name the common ground after adding p ; then p satisfies v relative to the common ground CG iff [CG after p] entails v .³¹ We propose to treat this condition as a presupposition of the use of 😊 in discourse. The use of 😞 in discourse likewise presupposes that [CG after p] entails $\neg v$. When an emoji's presuppositions

³⁰ As Dorit Abusch (2021 correspondence) points out, these are somewhat narrow values to hold with respect to oneself or Carlotta, and they likely stem from more general values such as *Carlotta's career is successful* and *Author's career is successful*. For expedience of presentation, we set aside these more general values here.

³¹ “CG after p ” here is a mnemonic to refer the common ground after the addition of a proposition p , normally defined as $CG \cup \{p\}$, following Stalnaker (1978).

are satisfied, it is able to make an informational update to the discourse regarding the author's affective attitudes.

Supposing that the common ground of (37b) includes the conditional proposition *Carlotta wins* \rightarrow \neg *Author wins*, then *Carlotta wins* + the common ground entails \neg *Author wins*. Since this violates the discourse value *Author wins*, the presupposition of 😞 is met, and its use is licensed. (The same kind of contextual entailment explains the felicity of [35b] when we assume that the common ground includes the conditional proposition *The wedding is on Saturday* \rightarrow \neg *The wedding is on a < > < > sunny day*.)

Yet this model of satisfaction must be expanded, not just to require contextual entailment, but also to be sensitive to the order in which propositions are added to the common ground. Recall the order effects observed in the discussion of the Hunger case (23ab) from Sect. 2.2.1:³²

- (38) a. I'm really hungry, just ordered some food. 😊
 b. #just ordered some food, I'm really hungry. 😞

In (38a), the use of 😊 is felicitous because it expresses happiness in the normal way that ordering food leads to the satiation of hunger, the value presumably evoked by the discourse. (38b) is infelicitous because it is deviant to indicate that one is happy about being hungry; certainly it does not lead to satiation. But (38a) and (38b) share the same common ground, so they should satisfy the same values, if value satisfaction is defined as contextual entailment. The problem, evidently, is that whether a value is satisfied or not is not a matter of how the whole common ground bears on that value, but to the specific contribution of the target.

We propose to zero-in on the contextual contribution of the target proposition, as opposed to the remainder of information already encoded in the context. The idea is to preserve the requirement that the target proposition contextually entails the discourse value, but combine it with the requirement that the previous state of the context *without* the target proposition does *not* contextually entail the value. Thus the emoji can be seen as commenting on what is specifically *added* to the context by the target proposition.³³ It is the violation of this requirement of novelty which explains the infelicity of (38b).

To model this proposal, we'll refer to the common ground as it was prior to the addition of *p*, as “[CG before *p*].” Then we can say that the use of 😊 presupposes

³² There is an obviously relevant difference between (38a) and (38b): in one case 😊 targets the proposition *order*, and in the other it targets the proposition *hungry*, so we don't expect the two to have the same felicity conditions. The problem is how to preserve this intuition once contextual entailment is adopted as the definition of value satisfaction, since contextual entailment elides the differences between the targeted proposition and the rest of the common ground. This is the purpose of assessing emoji relative to both the current and previous common ground.

³³ Although we do not focus on emotions of surprise, or correlate expressions of mirativity (Rett, 2021b), a parallel analysis would be called for. A surprised face comments on a target proposition as it contrasts with the expectations of the discourse participants prior to the addition of that proposition.

(i) that $[CG \text{ after } p]$ satisfies the discourse value and (ii) that $[CG \text{ before } p]$ does not satisfy the discourse value. We can then state the presuppositions for both positive and negative emoji as follows:

(39) Presuppositions of emoji

Given a discourse D , common ground CG , target proposition p , and discourse value v :

- i. The use of 😊 in D presupposes:
 - a. $[CG \text{ after } p]$ entails v ;
 - b. $[CG \text{ before } p]$ does not entail v .
- ii. The use of 😞 in D presupposes:
 - a. $[CG \text{ after } p]$ entails $\neg v$;
 - b. $[CG \text{ before } p]$ does not entail $\neg v$.

Returning to the infelicitous use of 😞 in (38b), here $[CG \text{ after } p]$ (where $p = \textit{Author is hungry}$) may entail future satiation, but only because the order for food is already in the common ground; so condition (39ia) above is met.³⁴ The problem is that $[CG \text{ before } p]$ entails the very same future satiation, so condition (39ib) is not met. Nothing of relevance to the discourse value is *added* by p , hence the presuppositions for the expression of the happy emotion are not met, so (38b) is infelicitous.

One might wonder why the conditions in (39) are presuppositions as opposed to part of the content an emoji adds to the common ground (in conjunction with the standard emotive content). While we explain infelicitous uses of emoji by appealing to presupposition failure, one might instead prefer to explain them as cases of contradiction with commitments already in the common ground. We prefer the presuppositional approach for two reasons.

First, conversationally relevant values are normally common ground prior to the communicative exchange. Often such values are obvious—we assume that those we talk to don't like to be hungry, for example. Values that are less obvious are typically signaled before the emoji that relies upon them is sent. It is unusual for me to communicate my happiness about something if you are unaware that I hold the value that makes sense of that attitude. (In the few cases in which that does occur, the normal mechanisms of presupposition accommodation are at work.) Thus, in general, it seems that information regarding the author's values are conditions on the acceptability of an emoji, rather than something the emoji adds to the common ground. Instead, the emoji's direct update to the common ground is confined to the author's affective attitudes, given those values as background.

The second reason for preferring a presuppositional account is that the conditions in (39) are not merely about a value's inclusion in the common ground, but impose constraints on the relationship between the value, the target proposition, and the rest of the common ground, present and past. Such meta-contextual relations cannot be represented directly as content to be added to the common ground. And intuitively they should not, since speakers may implement rules like this, but do not seem to

³⁴ We are glossing over the distinction between satisfying the value of being satiated in the future, and the value of being satiated now. We unravel this conflation in Sect. 3.5.

grasp them directly. The direct semantic effects of the use of an emoji should be limited to content-level contributions, while relegating more abstract constraint on context to the domain of presupposition.

3.4 Determining discourse value

We turn next to the pragmatic question of how discourse values are fixed in context. We take values themselves to be a part of the language-independent psychology of human agents. Which values are in principle available in a given discourse are constrained in part by the current message author, by the personalities of the conversational participants, by the kinds of values that are acceptable for the purposes of conversation, and by common knowledge. The difficult question for our purposes is which particular discourse value is contextually selected in a given conversation.³⁵ A predictive account of discourse value is well beyond the scope of this paper; for now, we merely wish to recognize the primary influences on value selection.

The first and foremost constraint on discourse value is that, under normal discourse conditions, it must be a value held by the current author and not the addressee or another discourse participant. This is implicit in the claim from Sect. 1 that face emoji are author-oriented: the emotions they express are by default attributed to the author (compare Rett, 2021a).³⁶ If the emotions in question are the author's, they must arise from the satisfaction or violation of values which are also the author's.

Given this general constraint, perhaps the easiest way for an author to convert a privately held value into a discourse value is to state it explicitly. It's hard to know *a priori* whether the gift of a cactus will be appreciated. But if your friend reports back from their second date by texting (40a), they explicitly state their values, and then express an affective state which reflects the congruence of these values with the facts. On the other hand, (40b) is confusing at best, in light of the explicitly stated value.³⁷

- (40) a. I love cactuses and she gave me a cactus. 😊
 b. #I love cactuses and she gave me a cactus. 😞

In other cases, the discourse value is not known to the audience prior to interpretation of the emoji, but the use of the emoji against a background of charitable interpretation allows readers to work backward to the intended value. As

³⁵ We assume that context determines a unique discourse value, but as Dorit Abusch (2021 correspondence) points out, this is a simplifying assumption. It seems that some vagueness in this regard is not only tolerable, but realistic. A reader might be unsure, for example, whether the discourse value is Carlotta's *winning* or Carlotta's *success in life*, but this will not affect the fluidity of a discourse with emoji. Still, the use of emoji when the discourse value is truly impossible to discern is marked at best. In either case, we take these to be essentially meta-semantic effects, having to do with interlocutors' comparatively vague or precise representations of context.

³⁶ See footnote 29 for discussion and qualification.

³⁷ Compare Kratzer (1991) on modal bases: "according to the laws," "according to the time table," etc.

a result, the emoji itself can be highly informative about the author's values. If your friend texts you with (41a), and you assume that their values and emotions are coherent, you may infer that the operative discourse value is one that positively assesses gifts of cactuses; the reverse is true for (41b). The interpretive reasoning at work here is one of accommodating the presuppositions that the target proposition bears favorably (or unfavorably) on the discourse value.

- (41) a. She gave me a cactus. 😊
 b. She gave me a cactus. 😞

Often the discourse value is closely connected with the purpose of the discourse itself. If the aim of the discourse is to resolve a QUD (*Question Under Discussion* [see e.g., Roberts, 2012]), one often finds that the discourse value is associated with one answer to the QUD. For example, the author in the scholarship case (37) presumably made their textual contribution primarily with the aim of informing the recipient about the status of the author's scholarship. It was only the contextual circumstance that made them mention Carlotta, and they would have mentioned someone else if someone else had won. The QUD in (37b) was not "who won?" but rather "did the author win?" So we can see the QUD in this case was directed at the same issue raised by the value itself. Indeed, often a QUD is made salient because of how it bears on a value.

Besides global reasoning, local linguistic phenomena also strongly influence the choice of discourse value. For example, positively and negatively valenced lexical items (Osgood et al., 1957; Bradley and Lang, 2010; Foolen, 2015: 479) can signal correspondingly valenced values. The uses of "stress" and "joy" below trigger the values *minimizing stress*, and *maximizing joy* respectively.

- (42) a. The stress was overwhelming. 😞 (adapted from Weissman, 2019: 479)
 b. The joy was overwhelming. 😊

Sometimes the influence of lexical choice on discourse value is less direct, but still pronounced. Consider again the scholarship example from (37ab) reproduced as (43ab) below. In (43ab) we considered target propositions expressed in terms of Carlotta; now, in (43cd), we consider them expressed with the first-person pronoun "I". Recall that only one person can win the scholarship, so Carlotta wins if and only if the author does not. Logically speaking, the propositions referring to Carlotta are equivalent to the propositions referring to the author. Yet we find an asymmetry in judgment.

- (43) *Context: The author and Carlotta are the finalists competing for a scholarship, which exactly one of them will receive. The author and Carlotta are close friends.*
- Carlotta got the scholarship. 😊
 - Carlotta got the scholarship. 😞
 - I got the scholarship. 😊
 - ?#I got the scholarship. 😞

(43c) is of course easy to parse: I am happy because my winning the scholarship satisfies my goal of winning. But (43d) presents a puzzle. It is clearly deviant to assume that I am sad that I won the scholarship. The problem is that a plausible alternate reading of (43d) (e.g., = *I am sad that Carlotta did not win*, which instead evokes the author's negative valuation of *Carlotta* not winning) is not immediately available in (43d); this unavailability stands in contrast with (43b), where the corresponding cross-matched value is available. (It is noteworthy that [43d] is significantly more natural if you are texting Carlotta directly—further evidence for the influence of conversational context on the availability of discourse value.)

We suspect this asymmetry is explained by the close connections between the self-oriented text of the target proposition and the self-oriented value it evokes. In (43a), the target text discusses Carlotta, so naturally highlights the author's values having to do with Carlotta. Meanwhile, the author's values *about themselves* are never far from consideration, so easily accessible in (43b), even though the text concerns Carlotta.³⁸ In (43d), by contrast, there is no mention of Carlotta, and the text is self-oriented, so only the author's values that concern the author themselves are immediately available.³⁹ In general, we hypothesize, the author's values about the author are always easily available as discourse values, but the author's values about other people must be explicitly signaled.

Although a detailed theory of discourse value lies beyond the scope of the current work, we have seen that the problem of determining discourse value is tractable. Discourse values must be compatible with: (i) the values held by the author; (ii) the values explicitly espoused by the author; (iii) the emoji they use; and (iv) background knowledge about the context. Interpreting affective discourse with emoji is partly a matter of finding the values that appropriately satisfy these variable constraints.

3.5 Analysis

We now summarize and partially formalize the analysis developed thus far. Informally, we may put our key claims as follows.

³⁸ The ubiquity of self-oriented values is consonant with the discovery of self-serving biases in social psychology. E.g., see Shepperd et al. (2008).

³⁹ It's possible that these effects can be overcome through explicit signaling, as the following may be acceptable: "Carlotta really deserved it more, but I got the scholarship. 😞"

(44) Core Proposal

Adding an affective face emoji E to a conversation immediately following an assertion of a discourse segment S conveys that the author has an affective attitude A toward a target proposition P relative to a discourse value V such that: (1) A is expressed by E ; (2) P is expressed or presupposed by S ; (3) V is held by the author; and (4) P promotes V or its negation in context, in accordance with the valence of A .

To formalize these ideas about the contribution of emoji to discourse we need to bring together three components: (i) an interpretation function for natural language clauses; (ii) an interpretation function for emoji; (iii) a system of discourse updates which shows how both enter into discourse, and accounts for presuppositions.

We have already stated the denotations for positive and negative face emoji, repeated here:

(36) Denotations for emoji

- i. $\llbracket \text{😊} \rrbracket = \lambda x \lambda p \lambda v. \{w \mid \text{happy}(x, p, v) \text{ at } w\}$
- ii. $\llbracket \text{😞} \rrbracket = \lambda x \lambda p \lambda v. \{w \mid \text{unhappy}(x, p, v) \text{ at } w\}$

For these denotations to have any empirical import they must be embedded within a theory of discourse. Here we enlist a simple model of discourse dynamics, and limit our focus, for present purposes, to discourses consisting only of emoji and linguistic assertions.

As discourse evolves, a series of discourse records are specified. The heart of a discourse record is (i) a Stalnakerian common ground, CG , understood as the set of propositions mutually accepted by the interlocutors for the purposes of conversation (Stalnaker, 2002). In addition, we have seen that we have reason to keep track of (ii) the previous common ground, OG (“old common ground”), prior to the most recent linguistic assertion. To this we add three elements: (iii) a salient proposition P , typically corresponding to the proposition expressed by the most recent declarative linguistic clause;⁴⁰ (iv) a salient discourse value V held by the current author; and (v) a simplified representation of the indexical context c , defined here only in terms of the current author and addressee.

(45) Discourse record

A discourse record $D = \langle CG, OG, P, V, c \rangle$ where:

- i. CG is the current common ground;
- ii. OG is the previous common ground;

⁴⁰ We leave emoji that accompany non-declarative clauses for future research. Note that we do not provide a deterministic theory of salient propositions. How to develop such a theory is a general problem for linguistic research beyond this paper. For our purposes, it is sufficient to acknowledge the way in which salience is relevant to the interpretation of emoji and to reflect that relevance formally. In cases of potential ambiguity such as (21)-(22), we leave open what the exact cognitive mechanisms are that go into making one proposition more salient than the other. However our system tracks a proposition’s status as salient, and this impacts emoji interpretation.

- iii. P is a proposition made salient by the most recent clause;
- iv. V is a discourse value such that $val(author_c, V)$;
- v. $c = \langle author_c, addressee_c \rangle$ is the current context.

The salient proposition P plays the role of supplying the target proposition for emoji. But we will also treat it, for now, as a model of at-issue linguistic content. In a final analysis, the available target proposition and at-issue content should not be conflated, since (as we observed in Sect. 2.2) presuppositions can sometimes become targets, even though they are not at-issue. For now, it will be convenient to unify these under a single variable. This will be unproblematic for present purposes, since the at-issue proposition is always among the candidate salient propositions P , and because the sentences we focus on are simple declaratives without relevant presuppositions.

The final step is to show how linguistic clauses and emoji update the discourse record. The semantic effect of a discourse consisting of a sequence of linguistic or emoji expressions $K_1 \wedge K_2 \wedge \dots \wedge K_n$ is understood as a sequence of updates to the initial discourse record D :

$$D[K_1][K_2] \dots [K_n]$$

Thus the discourse in (46a) is interpreted as imposing the sequential updates defined in (46b):

- (46) a. I'm really hungry. 😞
- b. $D[I'm really hungry.][😞]$

We first define linguistic update for linguistic assertion:

(47) **Linguistic update**

Where $D = \langle CG, OG, P, V, c \rangle$ is a discourse record and $D[S]$ is the result of updating D with an assertoric linguistic clause S :

$D[S] = \langle CG^*, OG^*, P^*, V, c \rangle$ where:

- i. $CG^* = CG \cup \{\llbracket S \rrbracket\}$;
- ii. $OG^* = CG$;
- iii. $P^* = \llbracket S \rrbracket$.

Clause (i) is essentially Stalnakerian assertion, where the content of the linguistic clause S is added to the common ground. Clause (ii) stores the current common ground, prior to updating, as the previous common ground. Clause (iii) requires that each successive declarative linguistic clause updates P , the immediately salient proposition. Again, this is how we provisionally model at-issue content.

To illustrate, let (48) be the initial state of the discourse (46a). We'll assume that, for extra-linguistic reasons, the discourse value in D is the satiation of hunger (represented by the proposition *satiation*) and that it is common ground that hunger implies the absence of satiation:

- (48) $D = \langle CG, OG, P, V, c \rangle$ where:
- i. $CG = \{hungry \rightarrow \neg satiation\}$;
 - ii. $OG = \emptyset$;
 - iii. $P = \emptyset$;
 - iv. $V = satiation$;
 - v. $c = \langle author_c, addressee_c \rangle$.

We now update D with the assertion “I’m really hungry,” where $\llbracket I’m really hungry \rrbracket = hungry$:

- (49) $D[I’m really hungry] = \langle CG', OG', P', V, c \rangle$ where:
- i. $CG' = \{hungry, hungry \rightarrow \neg satiation\}$;
 - ii. $OG' = \{hungry \rightarrow \neg satiation\}$;
 - iii. $P' = hungry$;
 - iv. $V = satiation$;
 - v. $c = \langle author_c, addressee_c \rangle$.

Next we define the update rules for positive and negative face emoji, (50). Here the presuppositions articulated in (39) are construed as conditions on successful update of the discourse by the emoji.

(50) **Emoji update (version 1)**

Where $D = \langle CG, OG, P, V, c \rangle$ is a discourse record, and $D[E]$ is the result of updating D with a face emoji E :

- i. $D[\text{😊}] = \langle CG^*, OG, P, V, c \rangle$ where:
 - $CG^* = CG \cup \{\llbracket \text{😊} \rrbracket (author_c, P, V)\}$ if
 - a. CG entails V ;
 - b. OG does not entail V ;
 - $CG^* = \emptyset$ otherwise.
- ii. $D[\text{😞}] = \langle CG^*, OG, P, V, c \rangle$ where:
 - $CG^* = CG \cup \{\llbracket \text{😞} \rrbracket (author_c, P, V)\}$ if
 - a. CG entails $\neg V$;
 - b. OG does not entail $\neg V$;
 - $CG^* = \emptyset$ otherwise.

(50i) says that updating a discourse D with 😊 adds the proposition $\llbracket \text{😊} \rrbracket (author_c, P, V)$ to the common ground if the presuppositions (50ia) and (50ib) are satisfied. (50ii) gives the parallel update rule for 😞.

To illustrate, suppose we continue the discourse from (49) as given in (51); assuming the presuppositions of the emoji are met, the common ground is now updated with the proposition that the author is unhappy about being hungry relative to the value of satiation.

- (51) $D[\text{I'm really hungry.}][\text{😞}] = \langle CG'', OG', P', V, c \rangle$ where:
- i. $CG'' = \{unhappy(author_c, hungry, satiation), hungry, hungry \rightarrow \neg satiation\}$;
 - ii. $OG' = \{hungry \rightarrow \neg satiation\}$;
 - iii. $P' = hungry$;
 - iv. $V = satiation$;
 - v. $c = \langle author_c, addressee_c \rangle$.

The rule which updates the common ground with $[[\text{😞}]](author_c, P, V)$ encodes three empirical assumptions. First, it requires that the denotation of the emoji be applied to the current author, so that the expressed emotion always reflects the author's perspective. Second, it identifies the currently salient proposition with the target proposition for the emoji. Third, it identifies the currently salient discourse value with the value relative to which the emoji is interpreted.

Unlike the linguistic update rule in (47), emoji do *not* update the salient proposition (nor the record of the previous common ground, OG). This means, within the current formal framework, that emoji contents are not at-issue, so are not available for subsequent anaphora, denial, or other discourse interaction. We think that updating with not-at-issue content is a satisfactory alternative to treating emoji as providing expressive, non-propositional content in the style of Maier (2021), Gutzmann (2013, 2015), or Kaplan (1999). A further empirical consequence is that multiple emoji as in (52) do not shift the target proposition.⁴¹ Here the second and third use of 😞 still comment on the target proposition that *the author is hungry*, rather than the proposition expressed by the first use of 😞 that *the author is unhappy about being hungry*.

- (52) I'm really hungry. 😞😞😞

Meanwhile, (50i-a) and (50i-b) are restatements of the informal presentation of presuppositions in (39). If they are met, the update goes through as above. If they are not met, the common ground is set to the defective null state. This is the model of presupposition developed by Heim (1983/2002). When the common ground is defective, infelicity results.

Clause (50i-a) requires that P contextually entails V .⁴² Clause (50i-b) requires that previous context before P was added, OG , does *not* entail V . Together, these constraints mean that 😊 is only felicitous when the target proposition makes a distinctive contribution to validating the discourse value, one that was not already present in prior discourse. When a negatively valenced emoji is deployed, the polarity of these claims is reversed, so that (50ii-a) requires that CG and P contextually entail $\neg V$, and (50ii-b) requires that OG does not entail $\neg V$.

⁴¹ What this analysis fails to capture is that repeated use of emoji tends to iconically express greater intensity of the emotion expressed. Following Sect. 1, we leave this effect to future research. In the current analysis, the second and third use of the same emoji are, technically, vacuous additions to the common ground.

⁴² Given our assumption that the emoji is always preceded by the sentence that expresses P , then, in the context of interpreting an emoji, CG always includes P .

In the case of the emoji in (46a) (and [51]), both presuppositions are met. Recall the state of the discourse before 😞 is added:

- (49) $D[\text{I'm really hungry}] = \langle CG', OG', P', V, c \rangle$ where:
- i. $CG' = \{hungry, hungry \rightarrow \neg satiation\}$;
 - ii. $OG' = \{hungry \rightarrow \neg satiation\}$;
 - iii. $P' = hungry$;
 - iv. $V = satiation$;
 - v. $c = \langle author_c, addressee_c \rangle$.

Presupposition (50ii-a) for the negative emoji 😞 is met, since $CG' = \{hungry, hungry \rightarrow \neg satiation\}$, and $\neg V = \neg satiation$, so CG' entails $\neg V$. And presupposition (50ii-b) for 😞 is also met since $OG' = \{hungry \rightarrow \neg satiation\}$, and $\neg V = \neg satiation$, so OG' does not entail $\neg V$.

By contrast, if the positive emoji 😊 is added instead, the discourse becomes infelicitous:

- (53) #I'm really hungry. 😊

We explain the infelicity here in terms of presupposition failure. Since $CG' = \{hungry, hungry \rightarrow \neg satiation\}$, and $V = satiation$, CG' does not entail V , so presupposition (50i-a) fails. Intuitively, the use of 😊 presupposes that the target proposition bears positively on the discourse value—however, given that the target proposition is *hungry* and the value is *satiation*, the presupposition is not met. We'll discuss more complex, multi-sentence order effects after the mechanism of promotion is introduced in the next section.

4 Promoting values

4.1 Satisfying and promoting discourse values

So far we have been treating values as unitary propositions which are satisfied or not by a given matter of fact. In reality, however, values are often hierarchically organized, with instrumental values leading on to ultimate ones (Ortony et al., 1988: 34–44). This is particularly vivid for the case of goals. For example, my ultimate goal might be to put dinner on the table by 7pm, but I have an incremental series of instrumental goals in virtue of my strategy for reaching this point: getting the pie in the oven by 6pm, cutting the beets before assembling the salad, and so on. We can expect that meeting an instrumental goal will also evoke a positively valenced emotion, as it foreshadows my ultimate success.

To regiment this idea, we shall say that, in a context, certain propositions which we'll call **outcomes**, stand in relations of **promotion** to one another. In Sect. 3.1 we provisionally opted to model promotion in terms of entailment, but we now move to a more flexible conception. We'll assume that promotion forms a weak partial order

(transitive, reflexive, and asymmetric) with a unique maximal element, which will call the **final outcome**, written as o_f . When an outcome o promotes another outcome o' , we'll write $o \gg o'$. When a series of outcomes are connected together in a **chain of promotion**, we'll refer to the non-final elements as **mediating outcomes**.⁴³

A paradigmatic relation of promotion holds between the instrumental goals that must be met as part of a strategy to achieve a final goal, and the final goal itself. More broadly, for one proposition to promote another is for the first proposition to enable, cause, make likely, or “open the door” to the latter.⁴⁴ As a heuristic, if you value A, and B promotes A, then, all else equal, you will attempt to bring about B as a means to bringing about A. Conversely, if you value A, but B promotes $\neg A$, then, all else equal, you will attempt to avoid B as a means to avoiding $\neg A$. To promote A, B need not entail, or be entailed by A, but it must be part of a natural course of events which lead to A, and it must be logically compatible with A.

In reasoning about the affective states expressed by emoji, we now want to shift our focus from whether the discourse value is *satisfied* by the target proposition (that is, contextually entailed by it) to whether the discourse value is *promoted* by the target proposition. In particular, we propose that the expression of a positive emotion presupposes that the addition of the target proposition to the common ground *further* promotes the discourse value, relative to the earlier state of the discourse. Intuitively, in such cases, the addition of the target proposition moves the author closer to their discourse value. Conversely, the expression of a negative emotion presupposes that the addition of the target proposition further promotes the negation of a value. (For example, spraining your ankle promotes losing the race, in which case the mediating outcome of spraining your ankle promotes a final outcome that negates what you value.)

To illustrate, consider a sequence of possible text messages I might send to you while hiking:

(54) *Context: Reports from the hike.*

- a. I'm a quarter-way to the top. 😊
- b. I'm halfway to the top. 😊
- c. I'm three-quarters of the way to the top. 😊
- d. I made it to the top. 😊

⁴³ The promotion relation is in many ways like the ordering over propositions induced by a Kratzerian ordering source (Kratzer, 1981/2012, 1991). The difference is that the promotion relation encodes *sequence*: to serve the pie, first you have to bake it, then you have to cut it, and only then can you serve it. Cutting it first, then baking it won't do. Ordering sources are indifferent to sequence, since proximity is calculated by overall similarity to the source. This limitation can be overcome by including sets of temporally chained propositions in the ordering source, but we find that this solution introduces unnecessary technicality, and it obscures the theoretical distinction between one's ultimate goal and the steps required to achieve that goal.

⁴⁴ Note that relations of promotion, so construed, are neither necessary nor sufficient for the promoted proposition to be true: not necessary, because more than one strategy can result in the same goal, and each promotes it; not sufficient because promoting an outcome is no guarantee of that outcome.

There is something annoyingly cheerful about all these reports, but they are linguistically unassailable. (54a), for example, is perfectly felicitous even though making it a quarter-way to the top is not itself a discourse value for the discussants, nor does it entail the value of making it all the way to the top. What licenses the expression of the happy emoji, instead, is the fact that *making it a quarter-way to the top* stands in a relation of *promotion* to the final outcome, *making it to the top*, and it is this outcome that is valued.

To implement this idea, we assume that each state of the discourse determines chains of promotion between relevant outcomes. As before, the presupposition of each emoji has two components: an (a)-component covering the current state of the discourse after the addition of the target proposition p , and a (b)-component covering the previous state of the discourse before p . The (a)-component requires that the target proposition (indirectly) promotes the discourse value; that is, there is some mediating outcome o such that: (i) $CG \cup p$ entails o , (ii) o promotes the final outcome o_f , and (iii) $CG \cup o_f$ entails the discourse value V .⁴⁵ The envisioned relationship between target, promotion, and value is illustrated below (Fig. 1):

The (b)-component of the presupposition requires that the prior state of the discourse before p was added, OG , not do better with respect to V relative to the promotion ordering. That is, there must be *no* mediating outcome o' such that: (i) OG entails o' , (ii) o' promotes o_f , (iii) $OG \cup o_f$ entails the discourse value V , and (iv) o' is further along in the chain of promotion than o (the mediating outcome from the (a)-component). This allows that the discourse prior to the addition of p may have promoted V , but it may not promote it *more* than the discourse after p .

Together, the (a)- and (b)-components of the presuppositions for 😊 require that, in the transition from the pre-target to post-target, the discourse as a whole moves *closer* (relative to a chain of promotion) to the discourse value. These ideas lead to the following revised denotation for positive and negatively valenced emoji:

(55) **Emoji update (version 2)**

Where $D = \langle CG, OG, P, V, c, \gg \rangle$ is a discourse record:

- i. $D[\text{😊}] = \langle CG^*, OG, P, V, c, \gg \rangle$ where:
 - $CG^* = CG \cup \{ \llbracket \text{😊} \rrbracket (author_c, P, V) \}$ if
 - a. there is an outcome o such that:
 - 1. CG entails o ; $o \gg o_f$; $CG \cup \{o_f\}$ entails V ;
 - b. there is no mediating outcome o' such that:
 - 1. OG entails o' ; $o' \gg o_f$; $OG \cup \{o_f\}$ entails V ;
 - 2. $o \gg o'$;
 - $CG^* = \emptyset$ otherwise.

⁴⁵ The current analysis cannot handle non-finite goals, such as *continually increasing my wealth as far as possible*, because we have assumed a maximal element in all chains of promotion (Dorit Abusch, 2021 correspondence). This issue presents technical challenges, but a possible solution is to allow for infinitely long outcome chains, while representing values as infinite series. For example, each outcome in an infinite promotion chain might correspond to a greater state of wealth, and the discourse value might also correspond to an infinite series of greater states of wealth. Then we could represent the (a)-component of the presupposition as follows: There is an outcome o such that: (i) CG entails o ; (ii) for any outcome o_n : if $o \gg o_n$, then $CG \cup o_n$ entails a member of V .

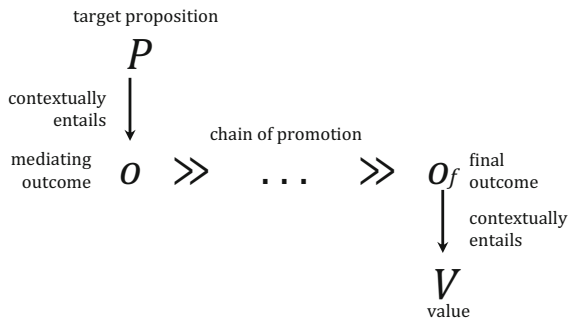


Fig. 1 Relation of target, chain of promotion, and value

- ii. $D[\text{😊}] = \langle CG^*, OG, P, V, c, \gg \rangle$ where:
 $CG^* = CG \cup \{[\text{😊}](author_c, P, V)\}$ if
 - a. there is an outcome o such that:
 - 1. CG entails o ; $o \gg o_f$; $CG \cup \{o_f\}$ entails $\neg V$;
 - b. there is no mediating outcome o' such that:
 - 1. OG entails o' ; $o' \gg o_f$; $OG \cup \{o_f\}$ entails $\neg V$;
 - 2. $o \gg o'$; $CG^* = \emptyset$ otherwise.

Where relations of promotion play no role, then the target proposition, mediating outcome, and final outcome are all identical, and the promotion-theoretical denotation is equivalent to the denotation given in Sect. 3.⁴⁶

Applied to (54a), the first report from the hike, let the target proposition $P = quarter$ (the author is a quarter way to the top), the discourse value $V = top$ (the author is at the top), and $quarter$ promotes top . Then the (a)-component of the presupposition for the use of 😊 in (54a) is satisfied because the following propositions all hold.

- (56) Given $D[\text{I'm a quarter-way to the top}]$:
- a. CG entails o ($quarter$);
 - b. o ($quarter$) $\gg o_f$ (top);
 - c. $CG \cup o_f$ (top) entails V (top).

The (b)-component of the presupposition comes into play in multi-sentence discourses, including one of our first cases, The Hunger. Consider the original case again:

⁴⁶ In the very simplest kind of case, where the target itself expresses the discourse value, then $p = o = o'$ = v. E.g., “I am healthy 😊,” “I am rich 😊,” or even “I am happy 😊.”

- (23) a. I'm really hungry 😞 just ordered some food.
 b. #I'm really hungry, just ordered some food. 😞

In (23a), the first linguistic clause expresses the target proposition *hungry*, which contextually entails the negation of the discourse value *satiation*, which in turn licenses the use of the negative emoji. The second linguistic clause expresses the proposition *order*, which promotes satiation, but does not entail it, which is why there is no logical conflict with the first linguistic clause. Thus the whole discourse is felicitous.

In our initial description of (23b) we said that the use of 😞 is infelicitous because the author should be *happy* about ordering food due to the eventual satiation it forecasts. The problem with this gloss is that, intuitively, we are happy about the prospective *consequence* of eating food, but the explicit target of the emoji concerns the *antecedent* act of ordering food. The gap between ordering and eating can now be filled by a chain of promotion. We assume that the mediating outcome of ordering food ($o=order$) promotes the final outcome of eating food ($o_f=eat$), which in turn entails the value of satiation ($V=satiation$).

To see why the presupposition of 😞 in (23b) fails, consider the state of the discourse just before the emoji is added:

- (57) $D[I'm really hungry][just ordered some food]=\langle CG, OG, P, V, c, \gg \rangle$ where:
- i. $CG = \{ordered, hungry, hungry \rightarrow \neg satiation, eat \rightarrow satiation\}$;
 - ii. $OG = \{hungry, hungry \rightarrow \neg satiation, eat \rightarrow satiation\}$;
 - iii. $P = ordered$;
 - iv. $V = satiation$;
 - v. $c = \langle author_c, addressee_c \rangle$;
 - vi. $\gg = \{\langle ordered, eat \rangle\}$.⁴⁷

The addition of 😞 to the discourse in (57) would presuppose that P (*ordered*) promotes a final outcome (*eat*) which contextually entails $\neg V$ ($\neg satiation$). But of course, *eat* contextually entails *satiation*, not its negation. So, the addition of 😞, as in (23b) is infelicitous.

4.2 Promotions along a scale

The formal structure of promotion allows us to model not just forward movement along a strategy that results in success, but any situation in which there are scalar magnitudes for which more (or less) is more (or less) valuable.⁴⁸ Indeed, this conception of naturally scalar values is the key to our analysis of The Game,

⁴⁷ For readability, we omit the reflexive and transitive closure of \gg .

⁴⁸ The scales in question may be intrinsic to the subject matter under discussion (such as numerical values), or they may be *ad hoc*, ordered on the basis of contextual assumptions (Hirschberg, 1985; Katsos, 2009).

introduced in Sect. 2. Our explanations of the judgements in this case are admittedly conjectural, but they help make sense of some of its more peculiar features in a reasonably principled manner. Recall the initial set of observations:⁴⁹

(58) *Context: We're watching college football; there are no ties; not winning is the same as losing.*

- a. There's a 50% chance we'll win. 😊/#😞
 b. There's a 50% chance we'll lose. #😞/😊

Although we are assuming that the text portions of (58a) and (58b) express equivalent propositions, the difference in lexical items selected to express these propositions clearly influences the felicity of the ensuing emoji. It seems this affective difference is the result in part of a difference in value. But this cannot be the whole story, since normally our values with respect to winning and losing are themselves equivalent—barring ties, the value *win* is equivalent to \neg *lose*.⁵⁰ Thus some further asymmetry is at work here.

Inspiration for our approach here comes from the folk-paradigm of the half-full, half-empty glass, now with a 21st century twist:

(59) *How much water is in the glass?*

- a. The glass is half-full. 😊/#😞
 b. The glass is half-empty. 😞/#😊

Describing the glass as “half-full” conveys a positive affect, not because of the quantity of water in the glass, but because it evokes a process of *filling*: starting from empty, the glass is now halfway on the route to fullness. Correspondingly “half-empty” evokes a process of *emptying*: starting from full, the glass is now halfway on the route to emptiness. So “half-full” brings to mind a direction of change towards fullness and “half-empty” a direction of change towards emptiness. These notional directions can now be thought of in terms of promotion. “Half-full” promotes fullness; “half-empty” promotes emptiness.⁵¹

Our idea is that judgements in The Game work according to a similar logic. Chances of winning are, metaphorically, waypoints on a path towards winning: having a 50% chance of winning promotes winning. Chances of losing are waypoints on a path towards losing: having a 50% chance of losing promotes losing. Though there is no literal process of filling and emptying to invoke here, the

⁴⁹ As discussed in Sect. 2.2.2, for (28–32) we assume a context where there are no relevant prior expectations about the chance of winning or losing.

⁵⁰ We assume that, typically, the discourse values for competitions are the categorical propositions *win* and \neg *lose*. For present purposes we assume the following equivalences: $win \equiv \neg lose$, $Chance(win)=100\% \equiv win$, $Chance(win)=0\% \equiv \neg win$, and likewise for chances of *lose*.

⁵¹ These points follow the spirit of Tversky and Kahneman's (1981) observation of framing effects on decision problems, and in particular, the influence of positive and negative language (“lives saved” vs. “lives lost”) on risk tolerance even in mathematically equivalent cases.

intuitive relation of promotion is the same, and we expect the same pattern to emerge for any kind of value-laden scale.

To implement this idea, we assume that, all things equal, a statement about the chance of winning as in (58a), has two characteristic effects. First, it sets the discourse value to the proposition *win*. Second, it induces a context in which a series of mediating outcomes concerning the lower bound on chances of winning are linked by promotion. We might call this an **at-least series** for chances of winning, illustrated below. Each proposition in the at-least series is a relevant pre-condition for the next. We assume that the final outcome, $Chance(win) \geq 100\%$, entails *win*.

$$[Chance(win) \geq 1\%] \gg [Chance(win) \geq 2\%] \gg \dots \\ \dots \gg [Chance(win) \geq 99\%] \gg [Chance(win) \geq 100\%]$$

We have assumed an *exactly* reading of the language in (58a), so that the target proposition is $Chance(win) = 50\%$.⁵² $Chance(win) = 50\%$ entails a point in the at-least series for chances of winning, the mediating outcome $Chance(win) \geq 50\%$. This proposition promotes the final outcome $Chance(win) \geq 100\%$, which in turn entails the discourse value *win*. Since the target entails a promotion of the discourse value, the happy emoji 😊 is felicitous, and the sad emoji 😞 is not. What the author expresses with 😊, in essence, is their positive emotion about the way that $Chance(win) = 50\%$ bears on the prospect of winning.⁵³ This is illustrated in Fig. 2.

(58a) There's a 50% chance we'll win. 😊/#😞

- $Chance(win) = 50\%$ (*P*)
- mediating outcome: $Chance(win) \geq 50\%$ (*o*)
- final outcome: $Chance(win) \geq 100\%$ (*o'*)
- discourse value: *win* (*V*)

The analysis of (58b) proceeds largely in parallel. With a discourse value of $\neg lose$, and at-least series running from $Chance(lose) \geq 1\%$ to $Chance(lose) \geq 100\%$.⁵⁴

This account of our judgements, though not without complication, helps to explain some of the more puzzling aspects of the case. For example, using the idea of promotion along an at-least series explains why the author in (58a) expresses a positive emotion towards the target, despite the fact that the target does not assert that the team is likely to win. The author is happy not about the satisfaction of any value, but about the promotion of the value of winning. Likewise, it explains why the author of (58b) may express negative emotion, though the target does not assert that the team is likely to lose: the reported fact promotes the outcome of losing.

⁵² See footnote 23.

⁵³ Note that the target proposition, $Chance(win)=50\%$, does not itself promote the final outcome, $Chance(win)\geq 100\%$, because they are logically incompatible. This is why it is important that, in our definition of the emoji presupposition, the target proposition *entails* a mediating outcome which promotes the final outcome; the target proposition itself does not have to promote the final outcome.

⁵⁴ Note that the discourse value must be $\neg lose$, equivalent to $Chance(lose)=0\%$, and not the weaker proposition $\neg(Chance(lose)=100\%)$, equivalent to $Chance(lose)<100\%$. Such a value would be satisfied by the target proposition that $Chance(lose)=50\%$, which would in turn license the happy emoji, contrary to our judgements about the case.

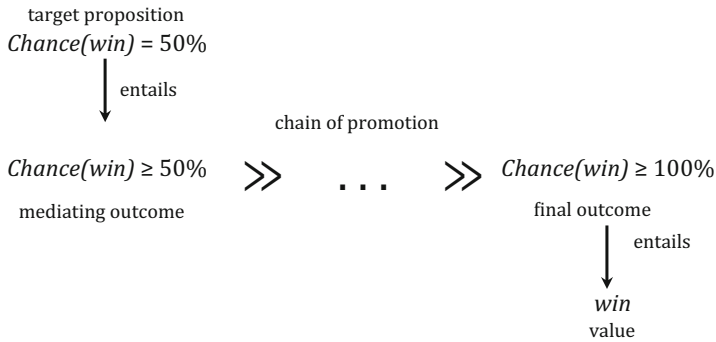


Fig. 2 Analysis of (58a)

This account also explains the surprising fact, observed in Sect. 2.2.2, example (32a), that the same distribution of emoji applies equally to any stated magnitude of chance for winning no matter how objectively dismal, as in (60) below. Even a 10% chance of winning will entail a point on the at-least series, which in turn promotes the discourse value of 100% chance of winning.⁵⁵

⁵⁵ We believe this account of the data is superior to a potential modal subordination explanation (Roberts, 1989; Stone, 1997,1999). According to such an analysis, talk about the chances of winning introduces a set of possible *win*-worlds into the discourse record, and the emoji takes this set of worlds as its target proposition. The positive emotion reflects the fact that all such worlds satisfy the value of winning. The envisioned dependence would run parallel to the modal subordination exhibited by a discourse like (a) below.

- a. There’s a 50% chance we’ll win! We’d be so happy (if we did).

But there are problems with this analysis. First, it makes the expressive effect of the emoji in (58ab) practically vacuous, reporting only that the author likes winning and dislikes losing. This misses the affective quality of future-oriented optimism (or pessimism) which seems to be reported in these cases (Matthew Stone, personal communication). Second, the modal subordination account also seems to make false predictions for (b) below, where subordination to the most salient possibility would require that the happy emoji is trivially felicitous. By contrast, we believe that the additional text muddies the context in a way that blocks the selection of a clear discourse value and promotion structure.

- b. There’s a 50% chance we’ll lose and a 50% chance we’ll win. # 😊/? 😞

However, Dorit Abusch (2021 correspondence) points out that the use of the positive emoji is improved when contrastive conjunctions are introduced, as in (c). There is evidence that such contrastive particles trigger a reset of the modal context (Greenberg, 2021b:§5), and we speculate that they may have a parallel effect on the salient proposition *P*, but further investigation is required.

- c. There’s a 50% chance we’ll lose but also a 50% chance we’ll win. 😊/# 😞

Third, the modal subordination analysis appears to predict that the “only” variants of the case, (61cd), should pattern just like the original (61ab); nothing about the use of “only” in the introduction of a possibility leads us to expect that it would block subsequent modal subordination.

(60) There's a 10% chance we'll win. 😊/#😞

4.3 Emoji, promotion, and *only*

Recall the observation from Sect. 2 that the introduction of *only* into cases involving scalar values, as displayed by the Game case, has the standard effect of reversing the felicity of valenced emoji.

(61) *Context: We're watching college football; there are no ties; not winning is the same as losing.*

- a. There's a 50% chance we'll win. 😊/#😞
- b. There's a 50% chance we'll lose. #😞/😞
- c. There's only a 50% chance we'll win. #😞/😞
- d. There's only a 50% chance we'll lose. 😊/#😞

We won't attempt to give a complete or compositional analysis for *only* and its effect on discourse value here. Still, certain general observations help make sense of the observed data.

Emoji aside, the use of *only* in a scalar context has the customary effect of signaling that an actual magnitude is lower than an expected magnitude on a common scale (Klinedinst, 2005: 11–12; Grosz, 2012: 249; Beaver and Clark, 2008: 249–260). Perhaps you think that \$30,000 is a lot of money to earn in a week, but if your colleague says:

(62) I *only* made \$30,000 this week.

then she clearly conveys that her earning expectations for the week were higher than \$30,000. So, as a rough generalization, we assume that the use of *only* in a scalar context like (62) signals that the stated magnitude falls *below* a magnitude that we will call the **prior expectation**.

Prior expectations interact with discourse values in predictable ways. *Only* signals that the actual scalar magnitude falls short of the expected scalar magnitude: whether this is a good or bad thing depends on the kind of scale involved. When the scale in question tends towards a magnitude whose realization is preferred, then meeting expectations is a value, and falling lower than expectations violates this value. Thus your colleague could have followed (62) with a sad emoji. When the scale in question tends towards a magnitude whose realization is dispreferred, then falling lower than expectations is a value, and meeting them violates this value. For example, "I *only* lost \$30,000 this week." Generally speaking, the introduction of *only* will turn a value-promoting proposition into a value-flouting proposition, and vice versa.

We can develop a plausible explanation of the Game cases (61cd) by looking closely at the interaction of promotion and prior expectation. Compare the target proposition and prior expectation in (61cd):

(61c) There's only a 50% chance we'll win. 😞/#😄

- target: $Chance(win) = 50\%$
- prior expectation: $Chance(win) > 50\%$
- discourse value: win

(61d) There's only a 50% chance we'll lose. 😄/#😞

- target: $Chance(lose) = 50\%$
- prior expectation: $Chance(lose) > 50\%$
- discourse value: $\neg lose$

In (61c), both the prior expectation, $Chance(win) > 50\%$, and the target proposition $Chance(win) = 50\%$, entail the mediating outcome $Chance(win) \geq 50\%$. And this promotes the final outcome $Chance(win) \geq 100\%$, which entails the discourse value win , as we saw above. Normally, this should license the use of the happy emoji. So what explains the fact that 😞 is felicitous and 😄 is not?

Our answer is that, intuitively, the target proposition entails a point that is *further away* from the discourse value, on the chain of promotion, than the prior expectation: that is, $Chance(win) = 50\%$ entails an intuitively weaker point in the at-least series than $Chance(win) > 50\%$.⁵⁶ So the assertion of the target proposition marks an unexpected step *away* from the ultimate goal of winning, and *this* is the source of the disappointment expressed by 😞. The same reasoning explains the infelicity of 😄.

An explanation along these lines applies to (61d) as well. Suppose the discourse value induced by talk of chances of loss is $\neg lose$. Now the target proposition $Chance(lose) = 50\%$ entails a *closer* point on the promotion ordering to this ultimate value than the prior expectation $Chance(lose) > 50\%$. The use of 😄 expresses happy surprise at this step *forward* towards the ultimate value.

Although this account of the data follows the spirit of the formal analysis offered in Sect. 4.1, it does not conform with the letter. The first problem is that, in our explanation of (61c) here, we assume that a step away from the discourse value, along a chain of promotion, licenses the use of the negative emoji 😞. But our official analysis only licenses 😞 when the *negation* of the discourse value is *promoted*. Moving away from a value and moving towards the negation of a value

⁵⁶ There are technical problems with implementing the intuitions reported here. Since the real numbers are continuous, there is no particular real number $m > 50$ such that $Chance(lose) > 50\%$ entails $Chance(lose) \geq m\%$. (This is because, for any m you might choose, there will always be a smaller $m' > 50$ whose chance value might be entailed instead, e.g., if $m=50.1$, there will be an $m'=50.01$ and so on for any further m' *ad infinitum*.) Instead, $Chance(lose) > 50\%$ and $Chance(lose)=50\%$ will entail the very same points on the at-least series. One way of capturing the intuition reported in the text is to assume that the at-least series progresses according to increments of a small positive value n , and then to adopt a corresponding background assumption like: $\forall x: [Chance(p) > x] \rightarrow [Chance(p) \geq x+n]$. Then $Chance(lose) > 50\%$ would entail $Chance(lose) \geq 50+n\%$ on the at-least series, while $Chance(lose)=50\%$ would only entail $Chance(lose) \geq 50\%$.

are of course closely related ideas, but they are not the same.⁵⁷ A future development of our view might unify these relations, or it might introduce a separate parameter for the role of prior expectations, following a common trend in emotion research (Ortony et al., 1988: 64–65). The second problem is that we have no official parameter to capture prior expectations. In principle, these might be incorporated into the previous common ground *OG*. This would require that we allow non-monotonic updates to *OG*, since the prior expectations in the examples at hand are *revised*, not merely updated.⁵⁸ Assimilating prior expectation to propositions in the previous common ground also fails to capture the sense in which prior expectations are *tentative*, as opposed to propositions of the common ground, which are normally treated as *given*. Once again, this may be a reason to posit an independent parameter for prior expectations.⁵⁹

Suffice it to say that the analysis developed thus far sheds light on *only*-cases like (61cd), and suggests plausible lines of analysis, but does not establish a full explanation.

In sum: we have proposed that emoji are not only sensitive to discourse values, but also to relations of promotion that structure the interaction between these values and the linguistically presented facts. The result, we believe, is an analysis of emoji meaning that is both faithful to the data and coherent with a psychologically plausible understanding of the affective states expressed. Of course, considerable work remains to extend this analysis to a broader range of emoji and a wider set of linguistic contexts.

5 Face emoji in the landscape of linguistics

5.1 Face emoji and expressives

In the preceding sections, we have explored the semantic contribution of face emoji in sentence-final position to linguistic discourse. In this section we conclude by provisionally positioning our analysis of face emoji within the broader landscape of linguistics and semantic analysis. We offer a partial comparison of face emoji with more familiar natural language expressions of affect, and with extant analyses of facial expressions that accompany spoken language.

A wide range of natural language phenomena have been recognized as expressive of affective attitudes and emotions.⁶⁰ They include:

⁵⁷ Likewise, in (61d), if we assume the operative promotion relation takes the form of an at-least series for chances of losing, then 😊 is licensed by a step away from the negation of the discourse value, rather than a step towards the value itself.

⁵⁸ In the current framework, updates to the common ground are only monotonic, with no allowance for revision. Such an extension might be achieved with the use of a non-monotonic logic, like that of Alchourrón et al. (1985) or Horty (2012). We leave such investigations to future research.

⁵⁹ In fact, the whole class of mirative affective states, and corresponding emoji, seem to involve the comparison of target proposition with a prior expectation, often relative to an ultimate value.

⁶⁰ See e.g., Gutzmann (2013), Foolen (2015), McCreedy (2020), among others. A classification of face emoji as *expressives* is in line with the earlier proposals for face emoji by Maier (2021) and Grosz et al. (2021).

- (63) Partial typology of affective language
- a. curse words: *fucking, damn*⁶¹
 - b. epithets: *bastard, idiot*
 - c. slurs: *Frog, Kraut*
 - d. use-conditional items: German discourse particles, Japanese honorifics
 - e. interjections: *wow, yay, oops, boo, alas, ouch*⁶²
 - f. evaluative adverbials: *fortunately, sadly, luckily, unfortunately*
 - g. intonation/prosody: rise-fall-rise intonation⁶³
 - h. punctuation: exclamation point (!), full stop (.)⁶⁴
 - i. predicates of personal taste: *fun, tasty*⁶⁵
 - j. socio-cultural expressions: *foreigner*⁶⁶

A full analysis of how face emoji fit into this landscape is a complex question, beyond the scope of this paper. Such an investigation might begin with Potts's (2005, 2007) proposal that the class of **expressives**, including curse words, epithets, slurs, and honorifics, are distinguished by six characteristic criteria. Whether face emoji meet these criteria is a rich and subtle question which we set aside for future work.

That said, we believe that there are especially fruitful parallels to be drawn between the uses of face emoji discussed in this paper and the class of expressions that Rett (2021a) has called **emotive markers**. Emotive markers include interjections and many evaluative adverbials in sentence-peripheral position. While recognizing that emotive markers and face emoji are ultimately distinct phenomena, subject to their own constraints, we wish to draw attention to three notable commonalities.

First, emotive markers appear in clause-peripheral positions, as in (64a) (adapted from Rett, 2021a). In this respect they are like face emoji, as in (64b), but differ from Pottsian expressives, (64c), which are often clause-medial.

- (64) a. Alas, Jane lost the race.
 b. Jane lost the race. 😞
 c. Jane lost the damn race.

⁶¹ On curse words, epithets, slurs, and honorifics, see Potts (2005, 2007) and Gutzmann (2015, 2019).

⁶² See Rett (2021a) on interjections and evaluative adverbials. See Haegeman (1984), Wilkins (1992), Ameka (1992), Wharton (2003), McCready (2008), Norrick (2009), Goddard (2013), Riemer (2014), Sauter (2014), and Zyman (2018) for earlier discussion of *interjections*; see also Ernst (2009), Maienborn and Schäfer (2011), and Liu (2012) for discussion of evaluative adverbials.

⁶³ See Pierrehumbert and Hirschberg (1990), Scherer (2003), Constant (2012), and Jeong and Condoravdi (2018).

⁶⁴ See Dresner and Herring's (2010: 253) discussion of the enthusiastic *Oh, great!* (with exclamation point) and its sarcastic opposite *Oh, great.* (with a full stop) in digital communication. See also Herring (2012).

⁶⁵ See Lasersohn (2005, 2009), Stephenson (2007), McCready (2007), Moltmann (2009), Pearson (2013), and Bylina (2014).

⁶⁶ See Mitchell (1986), Partee (1989/2004), and Oshima (2006).

However, it is interesting to note that emotive markers are generally more natural in clause-initial position, while emoji gravitate to clause-final positions. Thus the following variants of (64a) and (64b) in (65ab) are both marked.⁶⁷

- (65) a. Jane lost the race, alas.
 b. 😞 Jane lost the race.

Second, in Rett's analysis, emotive markers offer an affective comment on the proposition expressed by their clausal complement. Thus (64a) expresses not merely general sadness on the part of the author, along with the fact that Jane lost the race, but sadness *about* Jane losing the race. This account has obvious parallels with our own theory of propositional targets for face emoji.

Finally, both emotive markers (66a) and face emoji (67a) seem to make semantic contributions that are broadly not-at-issue, in the sense that they are not available for propositional anaphora or explicit denial, as shown in (66bc) (adapted from Rett, 2021a: 309) and (67bc), respectively.

- (66) a. A: Alas, Jane lost the race.
 b. B: That's not true, she won!
 c. B: #That's not true, you're glad she lost!

- (67) a. A: Jane lost the race 😞
 b. B: That's not true, she won!
 c. B: #That's not true, you're glad she lost!

By contrast, an explicit avowal of emotion that is anaphorically linked to the target proposition, as in (68), contributes at-issue content in the standard way.⁶⁸

⁶⁷ The possibility that clause-initial vs. clause-final positions have syntactic or semantic effects is a promising subject for future research. We note that message-initial emoji seem to function as 'stage setting' devices, which scope over the entire message, whereas message-final emoji exhibit adjacency effects, preferring to comment on the immediately preceding utterance. For that reason, (a) seems to be acceptable (as the negative '*sad I had to leave early*' is within the scope of the emoji), whereas (b) is infelicitous (as the emoji only scopes over the positive '*I'm glad I went*'). Examples (c)-(d) seem to exhibit the opposite pattern. Underlining marks the intuitive scope of the emoji in these examples.

- a. 😞 I'm glad I went to the party, but I'm sad I had to leave early.
 b. ?/# I'm sad I had to leave the party early, but I'm glad I went. 😞
 c. ?/# 😞 I'm glad I went to the party, but I'm sad I had to leave early.
 d. I'm sad I had to leave the party early, but I'm glad I went. 😞

⁶⁸ Thanks to Masha Esipova (2021 correspondence) for suggesting a paraphrase of this sort.

- (68) a. A: Jane lost the race. I'm so upset about it!
 b. B: That's not true, she won!
 c. B: That's not true, you're glad she lost!

5.2 Face emoji and gestures

In addition to the study of affective *language*, there is a long tradition of research within linguistics, but outside theoretical semantics, on facial expressions as they arise in conjunction with speech and signed language.⁶⁹ The formal semantics literature has recently taken a step towards the analysis of facial expressions that accompany speech by treating them as a form of co-speech gesture, and analyzing them within the emerging framework of gesture semantics.⁷⁰

Representative studies of facial expressions that accompany speech include Schlenker (2018a, 2018b) and Esipova (2019, 2020). Schlenker (2018a, 2018b) discusses a *disgusted* facial expression; Esipova (2019, 2020) discusses *mirative* facial expressions; Esipova (2020) also adds a discussion of the *eye-roll*.⁷¹ While all of these facial expressions have counterparts in the realm of emoji (🤢, 🤨 and 😏, for example⁷²), these studies have investigated questions that are largely distinct from, but complementary to, the issues pursued here.

For example, Schlenker (2018b) focuses on the semantic contribution that the *disgust* facial expression makes to the presupposition projections of accompanying text. Schlenker argues that this content is not-at-issue, but enters into non-trivial relations of “cosupposition” with the at-issue linguistic content. The evidence for these conclusions come from linguistic contexts where a facial expression accompanies a

⁶⁹ On facial expressions with spoken language, see e.g., Sendra et al. (2013), among many others. On facial expressions in sign language see e.g., Nespor and Sandler (1999); Reilly et al. (1990); Wilbur (2000); Sandler (2005); Dachkovsky and Sandler (2009).

⁷⁰ Recent work on the semantics of co-speech gesture include Lascarides and Stone (2009a,b), Ebert and Ebert (2014), Schlenker (2018a,b, 2019), Esipova (2019), Ebert et al. (2020). See Abner et al. (2015) for an overview of the descriptive literature.

⁷¹ Maier (2021: 25–26) also proposes an analysis for the smile as a facial expression. Notably, his sketch of an analysis, which treats smiling as an expressive similar to the word *oops*, does not assume that smiling comments on a proposition, but it expresses a positive attitude of the speaker towards the addressee. Since our focus is on face emoji that interact with text, this addressee-oriented use of the smile falls outside of our purview—that being said, the smiling face with smiling eyes emoji 😊 clearly has a use in the spirit of Maier (orthogonal to the present discussion) where it just expresses goodwill or friendliness towards the addressee.

⁷² Note that eye-roll emoji have certain properties that set them apart from other face emoji. For example, eye-rolls frequently occur in a message-medial position:

- a. Some people 😏 have apparently forgotten how walls and gates work.
 (example cited from Twitter).

sentence or predicate that is itself embedded under negation, a quantifier, or attitude report (Schlenker, 2018b: 313–314). We have not examined the emoji counterparts of such seemingly embedded uses of facial expressions or their projective behavior here, but we believe this would be an important step for future research.

At the same time, our analysis makes progress in a different dimension from Schlenker's discussion. While Schlenker treats iconic gestures and facial expressions as making the same kind of semantic contribution, the means by which they determine propositional content in fact differ in systematic ways. Iconic gestures offer direct illustrations or exemplifications of objects and events described in the linguistic text (Lascarides and Stone, 2009a, 2009b). But facial expressions like *disgust* express attitudes *about* the objects and events described in the linguistic text, in precise parallel with the analysis of face emoji offered here. The style of analysis pursued in this paper, which distinguishes between the subject, affective attitude, and propositional target of emoji, may also contribute to a more granular explanation of the semantic contribution of facial expressions.

Ultimately, we view the present account as only an initial step towards understanding the semantic contributions of face emoji in discourse. We look forward to future research in the super-linguistic spirit which integrates the insights and methodologies that have animated recent studies of expressives, emotive markers, gestures, and facial expressions.

6 Conclusion

In this paper, we have proposed a semantic analysis of the contribution that face emoji make to written linguistic discourse. We have discussed the interpretation of face emoji in sentence-final position, identified properties of emoji-text relations that are more constrained than one might initially expect, and outlined a formal semantic analysis of the interplay between the face emoji and the accompanying written text. Our analysis treats face emoji as propositional modifiers, which comment on a target proposition in view of how it bears on a contextually given discourse value. Such values reflect the author's desires, priorities, or wishes. Our analysis explains a range of emoji-based data, including ordering effects, contextual entailments, and the influence of lexical choice and framing effects on the expression of affect.

Outside of written digital communication, there are two clear points of comparison for face emoji: natural language expressions that are expressive of affective attitudes and the facial expressions in embodied, face-to-face communication. However, we maintain that emoji are a form of expression in their own right; there is no perfect correspondence to any purely linguistic phrase, nor to any embodied facial expression. This paper describes what we take to be some of the fundamental semantic features of this unique mode of modern communication.

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