

We Ought To Characterize Dyadic Prospects

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Abstract. This article presents preliminary evidence for a new class of future-oriented emotions based on the concerns of self and other, “dyadic prospect emotions.” To begin to characterize dyadic prospects, an experiment was conducted on the web to assemble a validated catalog stories dramatizing different combinations of desirability for self and presumed desirability for other. 80 stories were validated using data from 302 participants. New insight into the cognitive antecedents of *hope* and *fear* was obtained and two dyadic prospects were tentatively identified: *resignation* and *sacrifice*. More generally, early results suggest that dyadic prospects are a promising framework for exploring future-oriented social affect.

1 Introduction

For the last 15 years, many AI simulations incorporating emotion have employed the cognitive appraisal account of emotion as set out in [1] (but see, e.g., [2] for other approaches). While simulations have become vastly more detailed and domain general, the cognitive appraisal model at the heart of affective simulation has remained mostly unchanged. For instance, observe the increase in sophistication from The Affective Reasoner [3] to EMA [4].

Emotions have been explored relative to facial expressions (e.g., [5]), action tendencies (e.g., [6]), physiological activity (e.g., [7]), subjective experience (e.g., [8]), referents of words (e.g., [9]), and cognitive structure (e.g., [1]). Here I explore appraisals identified in [1] but combined in a novel way, namely *fortunes-of-others* appraisals in a future-oriented context, henceforth referred to as “dyadic prospects.”

To review, [1] organized the prospect emotion category into unconfirmed, confirmed, and disconfirmed with respect to the focal event. *Hope* and *fear* were identified as the unconfirmed prospect of a desirable or undesirable outcome, respectively. For example, (a) I hope to get a promotion and (b) I fear being robbed. While the prospect category deals with the relative time of events, [1] was not explicit about the present. The present is distinct from *confirmed* or *disconfirmed* in the sense that past-oriented emotions are excluded. For example, I was feeling satisfied while accepting my promotion but then I felt ashamed since I had used unethical means to achieve it. *Satisfaction* may occur in the present but *shame* is always past-oriented. It is necessary to make this distinction because the analysis here is concerned with future-oriented affective states (unconfirmed prospects), up to and including the present.

Fortunes-of-others emotions were indexed by two appraisals: reaction of self, whether pleased or displeased, and presumed value for other, whether desirable or undesirable. An example of each follows: (a) I was happy for my friend after he got a promotion, (b) I gloated after my tyrannical boss was fired, (c) I resented it when my tyrannical boss was re-hired, and (d) After I resigned, I pitied my beloved co-worker who remained on the tedious job.

Reexamination of [1] turned up an oddity. Two identified appraisals of situations, the event time relationship and whether egocentric or socially attentive, are considered in some combinations but not all. In particular, [1] does not explore the socially attentive, future-oriented combination and I am not aware of attempts to explore it elsewhere. Do future-oriented social emotions simply not exist? If they exist then how may they be characterized? Starting with scant intuition about dyadic prospects, I designed an experiment to validate a catalog of short stories dramatizing different combinations of intention for self and presumed intention for other. This experiment was conducted on the world-wide-web using software developed by the investigator.

Table 1. Categories of Intent

Probe Sentence	Abbrev.
<i>Agent</i> wants <i>topic</i> .	ProGoal
<i>Agent</i> wants to avoid <i>topic</i> .	AntiGoal
<i>Agent</i> feels indifferent about <i>topic</i> .	NoGoal

Note. Intent and its explicit proposition or topic are the constituents of a goal.

Desirability or intent was partitioned into three categories (see Table 1). I preferred the term *intent* because of the ease of referring its absence; *NoGoal* seemed less confusing than *neutral desirability*. A natural way to describe the participants of a dyadic prospect is to adapt pronoun categories. The agent who imagines the scene is the “first-person.” The “second-person” is the other agent who is presumably involved in the situation. This terminology is merely shorthand. For example, in a prospect-confirmed context, the antecedents of *gloating* are the first-person being pleased about an undesirable event for the second-person. If the convention is adopted that goals are given in the sequence (first-person, second-person) then the nine provisional dyadic prospects can be written as $\text{affect}(g_1, g_2)$ where $g_1, g_2 \in (\text{NoGoal}, \text{ProGoal}, \text{AntiGoal})$.

2 Validate a Catalog of Stories

2.1 Method

Participants. Participation was solicited with a promised incentive of about $8\frac{1}{3}$ cents per page (\$10 per hr assuming 30 s per page).¹ The number of participants

¹ For example, <http://www.freesamplesite.com/ydf/showthread.php?t=191091>.

was not predetermined. The experiment was run until 5 or more stories were identified for each dyadic prospect category. Hence, the number of participants and demographic data are presented in the Results section.

Table 2. Sentences Employed to Probe Intent

Intent	First-person (g₁)	Second-person (g₂)
<u>AntiGoal</u>		
Template	<i>First-person</i> wants to avoid <i>topic</i> .	<i>First-person</i> believes that <i>second-person</i> ought to avoid <i>topic</i> .
Instantiation	Mala wants to avoid getting payment for the ivory tooth.	Mala believes that Ted ought to avoid paying for the ivory tooth.
<u>ProGoal</u>		
Template	<i>First-person</i> wants <i>topic</i> .	<i>First-person</i> believes that <i>second-person</i> ought <i>topic</i> .
Instantiation	Mala wants to get payment for the ivory tooth.	Mala believes that Ted ought to pay for the ivory tooth.
<u>NoGoal</u>		
Template	<i>First-person</i> feels indifferent about <i>topic</i> .	<i>First-person</i> believes that <i>second-person</i> ought to feel indifferent about <i>topic</i> .
Instantiation	Mala feels indifferent about getting payment for the ivory tooth.	Mala believes that Ted ought to feel indifferent about paying for the ivory tooth.

Note. Templates are instantiated in the context of Story 1 (provided in Appendix A).

Table 3. Second-Person Intention, Candidate Probe Sentences

# Probe	Evaluation
1	Mala believes that Ted wants to pay for the ivory tooth. unbelievable (not tested)
2	Mala believes that Ted should pay for the ivory tooth. equivocal ^a
3	Mala believes that Ted ought to pay for the ivory tooth. $N = 8, M = .94, SD = 0.18$ ^b

^aTested informally in a pilot. ^bOn an interval scale of -1 (*highly unbelievable*) to 1 (*highly believable*).

Item Presentation. Ninety stories, each with an illustrative photo, were prepared by the investigator. The probe sentences in Table 1 were customized for each story (e.g., see Table 2). Probes were tested for *believability* using a 5-point Likert-like scale. (Although I only wanted to discover whether a given probe and story were coherent together, it might have been confusing to offer the choices

“true” and “false” only.) Due to obviousness, it seemed unnecessary to use more than one probe per construct. Hence, the present experiment is more properly termed a *quasi-experiment* to reflect the lack of controls.

The presence of “ought” in the second-person probes warrants discussion. What is at issue is how to accurately probe second-person intention. What is needed is to probe Mala’s belief about Ted’s intention where *belief* may be meant in the active sense of trying to influence or coerce. Table 3 lists some alternatives. Probe 1 is essentially the same as a first-person probe from Ted’s point of view. In other words, the prefix “Mala believes that” is impotent and, counterintuitively, Probe 1 merely taps first-person intention.

There may be a connection between Table 3 and one anecdote: Ortony re-evaluated his original theory [1] in [10]. One significant change was the discontinuance of fortunes-of-others emotions [10] but scant rationale was offered for this decision. Table 3 suggests that second-person concerns may not be accessed without something like *ought*. So I speculate that fortunes-of-others emotions offered little explanatory power beyond egocentric *pleased* and *displeased*.

Needless to say, Probe 3 was employed in the present experiment. In stories where there was negligible intent to influence, “ought” may have detracted from clarity of expression. Even so, consistent wording was deemed more important than trying to determine a priori when to employ or omit *ought*.

Table 4. NoGoal Variations

Abbrev.	Goal Proposition Status	Sentence Probe Template
NoGoal _u	unfulfilled; implicit indifference	<i>First-person</i> believes that <i>second-person</i> ought not consider the possibility of <i>topic</i> . ^a
NoGoal _i	explicit indifference	<i>First-person</i> feels indifferent about <i>topic</i> .
NoGoal _e	wanted and fulfilled	<i>First-person</i> enjoys <i>topic</i> .

^aNoGoal_u is not meaningful in a first-person context. Hence, the second-person sentence template is exhibited here.

So far, I have discussed only one of three templates associated with NoGoal. Table 4 lists all three varieties. For each story, the investigator determined the NoGoal variety a priori. A more robust procedure would be to test all three variations and include whichever are believable, however, there was little risk associated with making the wrong choice. At worst, the NoGoal variety chosen would be found unbelievable and excluded from the experiment.

Procedure. A subset of yet to be validated stories were randomly selected for each participant. Participants rated the believability of each probe with respect to its story. To reduce repetition, first-person probes were presented together on one page (3 items) and second-person probes were presented together on one page (3 items). In the cases where more than one goal topic was tested in

the context of a single story, all the probes related to a particular topic were presented together (on multiple pages). Aside from these orderings, the probes and stories were presented in random order.

Vandal Detection. One hazard of collecting data on the web is that anybody can participate, even those who behave like vandals. To combat this threat, a participant was classified as a vandal if he gave the same rating to all questions or completed the study too quickly, meaning $P_{40}(\text{time per page}) \leq 12$ s.

2.2 Results

Participants. Three hundred ninety six people participated. Twenty four percent ($n = 94$) were classified as vandals: 15 gave the same rating to all questions and 79 completed the study too quickly. Among the participants with acceptable data ($n = 302$), 102 participated anonymously and 200 registered with an e-mail address. Quartiles of the number of pages completed per participant were 8.25, 23, and 33. Since every probe was rated by somewhat different participants, demographics are approximate: 82% were female and 18% male; and 77% were located in N. America and 23% in other areas. Quartiles for participant age were 27, 35, and 44.

Goal Pairs. Data were treated as if on an interval scale. A probe was judged believable if the 95% confidence interval for the mean was entirely on the *believable* side of the scale. Unbelievable probes were segregated from further enquiry. I did not try to determine why a probe was judged unbelievable, whether the probe failed to be a consequent of the story, the story was poorly written, or some other reason.

A pervasive assumption was that the combination of two believable probes (first- and second-person) was also believable. There was one special exception necessitated by the definition of NoGoal_e . Since ProGoal is implicit in NoGoal_e , the believability of ProGoal was discarded if NoGoal_e was found believable.

Eighty probe pairs were found believable. The 80 pairs were supported by 154 probes (as mentioned, some probes were used in more than one pair). The number of ratings per probe ranged between 5 and 172 ($Mdn = 17$).

3 Discussion

I will identify concerns with the present study before considering how to link the results with emotion theory. Perhaps the most serious shortcoming was that all the stories were written by the investigator. Care was taken to author diverse stories and I often failed to predict how the goal structure of a story would be classified. Still, it would be reassuring to test stories written by a wide variety of authors.

Topic Negation. At first glance, it might seem as if goal-pair category assignment is arbitrary. With respect to Story 1 (provided in Appendix A), if Mala wants to get payment for the ivory tooth (ProGoal) then she also wants to avoid having the ivory tooth stolen (AntiGoal). Essentially the same goal can be categorized as ProGoal or AntiGoal depending on the phrasing of the topic. What makes a goal-pair profile meaningful as a unit is that the second-person’s intention is similarly constrained. Or is it?

I tried to concoct stories to defeat these interlocking constraints. Suppose one intention is NoGoal, the other intention is not NoGoal, and the topic has a trivial negation (meaning the same topic with the addition of “not” and any repairs for awkward phrasing). It appears that the classification of such a story is indeed arbitrary amongst two categories. More experience is needed to better understand how to interpret topics which can be negated.

NoGoal. In the present article, NoGoal varieties (review Table 4) were collapsed into a single category. However, an informal perusal of the representative stories from the categories (NoGoal, ProGoal) and (ProGoal, NoGoal) suggest that the corresponding affective states are not sharply defined. At least some goal pairs which involve NoGoal probably subdivide on the basis of the NoGoal variation.

3.1 Is it an Emotion?

The remainder of this section will focus on two categories for which validated stories seem least ambiguous: (ProGoal, AntiGoal) and (AntiGoal, ProGoal). Various criteria have been proposed for deciding what counts as an emotion and what does not. Here I do not reference any such criteria but instead test the predictive accuracy of preexisting emotion theory.

Dyadic prospects are deliberately arranged such that the antecedent appraisal for egocentric emotion is one of the appraisals of a social dyad. In other words, the egocentric appraisal could be considered nested within a social context. The question I will examine is whether the overall theme of the social situation is consistent with the nested or embedded egocentric emotion.

Considering [1], one would expect that all instances of an uncertain desirable event would evoke a hopeful response. An empirical study of appraisal determinants of emotions [11] upheld this relationship. However, examine believable appraisals of Story 2:

1. Hugo wants to play in the water. (ProGoal)
2. Hugo believes that Susan ought to avoid seeing him play in the water. (AntiGoal)

Hope is predicted from the first (egocentric) appraisal.² However, if Hugo is matured (7 or more years of age according to [12] wherein transgression was

² I take the view that *hope* is always egocentric whether the hoped for proposition involves another person or not. There are not two flavors of hope, one for inanimate objects and one for animate. Animacy is not even an intensity variable for *hope*.

examined from a developmental perspective) and decides not to sneak out to the beach then the same two appraisals seem to hold but *hope* is overpowered by *resignation*, a dyadic prospect emotion (proposed). *Resignation* is not typically conceived of as a prospect but its two antecedent appraisals are set in prospective terms, one against the other, so it does not seem entirely improper to classify *resignation* as a prospect emotion, though a limiting one. As with other emotions, the choice between *hope* and *resignation* is ostensibly mediated by emotion-focused coping (for review see [4]), a personality bias towards either egocentric or socially attentive construal, or some other mechanism. The argument for *fear* is similar. Believable appraisals of Story 3 were:

1. Draven wants to avoid pushing her on the swing. (AntiGoal)
2. Draven believes that Maribel ought to be pushed on the swing. (ProGoal)

The first appraisal is an uncertain undesirable event upon which *fear* is predicted (again according to both [1] and [11]). Yet, supposing Draven is socially attentive then *sacrifice* seems more appropriate. To summarize, in the cases of both *hope* and *fear* it appears that a socially derived something may interfere with or override an embedded egocentric emotion. This something is a likely candidate for classification as emotion because of its intimate interaction with emotion. At a minimum, the present data suggest that the cognitive antecedents of *hope* and *fear* are not as simple as was claimed in [1].

4 Conclusion

Robotics and, more generally, human-computer interaction demand an understanding of the bounds of social and egocentric affect and how these two domains fit together. For instance, without a precise understanding of presumption, robots will have difficulty understanding the many forms of persuasion and will also be at a disadvantage if trying to persuade humans. The present article is important because it advances a parsimonious model for representing the future-oriented affective state of a social dyad.

In [1], “ought” was used to probe standards for attribution emotions such as *admiration* and *reproach* (e.g., “He ought not have done that.”). The present article broadens the utility of “ought” to future-oriented persuasion. The findings with respect to *hope* and *fear* are important in their own right, but also support the content validity of the dyadic prospect model, albeit in a small and limited way. More studies are needed to replicate and extend the results reported here.

Acknowledgments. William L. Jarrold provided copious encouragement and useful feedback. Simon Masters suggested “ought” for second-person probes. I am thankful to all the participants, especially the anonymous participants.

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5 Appendix A – A Selection of Validated Stories

1. Ted walks into an antique shop. Mala, the shop owner, notices as Ted slips an antique ivory tooth into his bag and walks out without paying.
2. Since Hugo has a cough and fever, his mom, Susan, forbade him to go swimming. Hugo is unusually susceptible pneumonia. He has contracted the infection almost every year since he was a baby. Even so, Hugo can't resist the beckon of warm sun and frolicking friends. He resolves to sneak out to the beach while his mom is away shopping.
3. Maribel is still too young to understand how to propel herself on a swing. Her father Draven gives her a strong push every so often to keep her in motion. Draven has long since tired of pushing Maribel. He can imagine a hundred other more interesting things to do. However, Maribel's obvious enjoyment compels him to continue indefinitely.