# Artifices For Persuading To Improve Eating Habits

**Irene Mazzotta and Fiorella de Rosis**

Intelligent Interfaces, Department of Informatics, University of Bari
Via Orabona 4, 70126 Bari, Italy
{mazzotta, derosis}@di.uniba.it

**Abstract**

Eating habits are influenced by emotional factors. Persuasion to change wrong habits should therefore act on the central and the peripheral route at the same time, by combining rational and emotional strategies appropriately. In this paper, we describe an ongoing research which is aimed at simulating persuasion dialogs in this domain. We describe how we collected and analyzed a corpus of messages and how we compared the persuasion strength of rational vs emotional, negatively vs positively framed discourses. We conclude the paper with a discussion of the knowledge representation methods that are suited to represent these strategies.

## Introduction

Eating habits are the result of cultural, psychological, training and life style factors: they tend to consolidate in time and, when wrong, are quite difficult to modify. On the other side, they are strongly influenced by emotional factors. Information media are masters in employing any kind of tricky argument to persuade the population to consume products of doubtful healthiness: according to the local culture, irony or sex are the strings most frequently touched by advertizing. Attempting to contrast this pressure to persuade the population to adopt more appropriate habits, by employing only 'rational' and 'scientific' arguments is probably not effective. Therefore, this is one of the domains in which artifices are justified, if not needed. Of course, as suggested by Walton (1992), attention should be paid to insure that arguments are relevant (they contribute to the goals of the dialogue that the participants in the argument are supposed to be engaged in) and strong (they are based on evidence rather than only on presumption).

The extent to which an argument is relevant or strong depends on the characteristics of the message receiver. This is even more true when artifices are employed in the persuasion process. Hence, adaptation of the message to the presumed characteristics of the receiver is a means to increase its persuasion strength.

Our group began to work on persuasion strategies a few years ago, proposing a formalism to represent knowledge in Walton and Reed's argumentation schemes. Belief networks (Pearl, 1988) were employed to represent these schemes, and we demonstrated how this kind of knowledge base could be used, at the same time, to generate receiver-tailored persuasion messages and to respond to subsequent 'critical questions' (Carofiglio, 2004). We subsequently cooperated with some experienced psycholinguists in studying whether this formalism might be employed, as well, to represent some form of 'a-rational' persuasion (Miceli et al, in press). We employ this adjective to name the kind of persuasion strategies in which 'purely rational' arguments are combined in various ways with 'emotional' ones. We claimed, in that context, that emotional persuasion cannot be considered (as some authors tend to do) as an 'irrational' attempt to influence the receiver's mind, because typically rational forms of 'planning' and 'reasoning on the interlocutor's mind' are performed by the persuader also in this case.

In the two mentioned steps of our research, we worked on some examples of daily life rather than on an organic corpus of data. To root the range of envisaged strategies on concrete data, we afterwards decided to collect a more systematic corpus and to test how much persuasive were perceived texts adopting different strategies. This paper describes how this corpus was collected, analyzed and evaluated, and draws some conclusions on which formalism may be applied to represent these strategies.

## The corpus

The corpus of persuasion messages was collected with a website (http://www.di.uniba.it/intint/H-persuasion-bi.html) in which a scenario was presented initially to describe the 'situation' in which the subjects involved in the experiment (the 'persuaders') should imagine to be in. The scenario began as follows:

> "*Mary, one of your best friends, is a 25 year old girl who follows a wrong diet. She does not eat much fruits and vegetables while tends to overeat meat, sweets and pasta. Try to persuade her to eat more fruits and vegetables and, in doing so, don't forget that Mary is famous for her obstinacy!"*

The facts the subject was supposed to know about the effects of eating vegetables were then formulated differently, in two versions of the scenario:

a. In the '*positive framing*' version, the text was the following:

*"You know the following facts: eating fruits and vegetables is good for health. They are good sources of vitamin A and C, which are important for growth and repair of body tissues, to cleanse the blood and give resistance against colds. Moreover, various epidemiological studies proved that a diet rich in vitamin A and C decreases the risk of coronary heart diseases and stomach cancer."*

b. In the '*negative framing'* version, the text was the following:

*"You know the following facts: eliminating fruits and vegetables from diet may have detrimental effects on your health. Shortage of vitamins prevents blood cleaning and body tissue regeneration, increases susceptibility to cold and infections and makes blood vessels weaker, by producing nose bleeding. In addition it increases the risk of cardiac disease and stomach cancer."*

The two versions of the scenario ended in the same way:

*"In addition, consider that health is very important for Mary: she likes sports, undergoes periodical check ups and looks at TV programs about health care. Mary would have enough free time to cook vegetables and delicious fruit dishes.*

*Please, use this information to write a text (from 5 to 10 lines) to argue about your thesis."*

The two scenarios were selected at random to be displayed to the subjects. They were conceived so as to suggest the following keypoints in selecting the persuasion strategy:

a. Friendship relation between persuader P and recipient R (Mary in the previous example)
b. R' personality (to be obstinate)
c. R' goal (to be in good health, in the previous example scenarios)
d. R's living habits (makes sports, undergoes checkups, looks at specialized TV programs)
e. Holding of conditions to make the action possible (R has time to prepare vegetables)
f. Relationship between desired action (eat vegetables) and likelihood to achieve R's goal to be in good health.

The hypothesis was that, in conditions of cognitive coherence, the following implication holds (Miceli et al, in press):

$$[(\text{V-Goal R q}) \wedge (\text{A-Goal R q}) \wedge (\text{Bel R (Do(R,p)} \rightarrow \Diamond \text{q})) \wedge \text{Bel R CanDo(R,p))}] \Rightarrow \text{IntToDo(R p)} \quad [1]$$

where: p is a variable denoting an action (e.g.: p = to eat vegetables); q is a formula denoting states of the world that may include agents such as R (e.g.: q='R is in good health'); ◊q denotes states of the world which are holding in a more or less near future; Bel, Int, A-Goal, V-Goal are modal operators to denote the various aspects of the mental state of agent R which are relevant in persuasion processes, that is, respectively, beliefs, intentions, active-goals and valued-goals. In particular: (V-Goal R q) means "*R has goal q*"; (A-Goal R q) means "*R has the active goal q*"; (Bel R (Do(R,p)→ ◊q)) means "*R believes that doing p implies achieving q in a more or less near future*"; ((Bel R CanDo(R,p)) means "*R believes that conditions hold to make p*"; IntToDo(R p) means "*R should have the intention to make p*".

Relation [1] should therefore be read as *"if R has goal q and this goal is active, and R believes that doing p implies achieving q in a more or less near future, and R believes that conditions hold to make p, then R should have the intention to make p"*. In the scenarios, premises were presumed to be true but the consequence was not. This was therefore a case of *cognitive dissonance* similar to the smoking example originally formulated by Festinger (1957).

## Outline of Corpus Analysis

We collected, overall, *32 messages* from Italian subjects aged between 23 and 63, of both genders, with different backgrounds (psychology, philosophy, medicine, computer science). As our aim was not to study the influence of the persuader's characteristics on the strategy selected, we will not attempt to analyze the relationship between the persuader's background, age or gender and the message content. We will rather examine variations in strategies and will reason on their possible formalization.

We factored every message in the corpus into 'discourse segments', by defining segment boundaries according to the intentional structure (Grosz and Sidner, 1986). A discourse segment could include one or more utterances with a given communicative goal and addressing one of the mental state components described in the relation [1]. Some segments were aimed at evoking the interlocutor's cognitive dissonance or at displaying empathy.

Table 1 shows that the average number of discourse segments per message did not differ in the messages originating from positive and negative framing scenarios.

Table 1

| | Scenario | |
|---|---|---|
| | Negative framing | Positive framing |
| n. of messages | 17 | 15 |
| n. of segments | 91 | 84 |
| av n. of segments per message | 5.4 | 5.6 |

### Framing effect

The first aim of our evaluation study was to test the 'framing effect' of the persuasion scenario on the strategy adopted. We wanted, in particular, check whether formulating the scenario in negative or positive terms

affected the valence of arguments employed. Levin et al (1998) defined three types of framing:

- *risky choice*, originally introduced by Tversky e Kahneman (1981), which consists in describing the "*outcomes of a potential choice involving options differing in level of risk*". Example: *"a sure saving of one-third of the lives"* vs *"a sure loss of two-thirds of the lives;*
- *attribute framing*, which concerns description of objects or events. Example: *"pork meat contains 85% of lean"* or *"15% of fat"*. Finally:
- *goal framing*, which involves description of goals for which a given action should be followed.

We differentiated the scenario according to goal and attribute framing. In analyzing the texts in the corpus, we categorized every discourse segment as using 'negative' or 'positive' arguments after considering whether they included any of the three mentioned types of framing. The segment was tagged as 'neutral' when no negative or positive risk, attribute or goal framing was employed. Table 2 describes the proportion of negative, positive and neutral arguments in the messages produced from subjects who initially were displayed a negatively or positively framed scenario. This table shows that there was, in our subjects, a trend to combine negative with positive arguments. A large proportion of positive arguments was employed also when the case was presented in a negatively framed scenario, while a lower proportion of negative arguments was included in the positive framing case. This shows that subjects tended to prefer employing positive arguments to negative ones.

Table 2

| | Scenario | |
|---|---|---|
| | Negative framing | Positive framing |
| Discourse segments using negative arguments | 30 | 22 (26%) |
| Discourse segments using positive arguments | 42 (46%) | 42 |
| Discourse segments using neutral arguments | 19 | 20 |
| Total | 91 | 84 |

## Emotional vs rational strategies

The second aim of the study was to test whether the 'rational' formulation of the scenario resulted in using rational arguments in the messages. The scenario was formulated so as to raise the subject's attention on 'rational' persuasion arguments (positive or negative effects of a diet respectively rich or poor of vegetables). One could therefore expect a prevalence of this form of argumentation in the messages produced.

We classified a discourse segment as 'emotional' when it included one of the techniques mentioned in (Miceli et al, in press):

- 'appeal to the goal to feel an emotion'; example: *"You will enjoy by preparing delicious fruit recipes"*
- 'emotional activation of a goal'; example: *"You are a so clever cook!"*
- expression of emotion in the language style: *"delicious dishes', "a crispy salad", "a tasty and coloured salad"*
- display of some form of empathy: *"I would be delighted to meet you and discuss pleasantly, in a good dinner, what means to feed healthily"*

Contrary to our hypothesis, the majority of the discourse segments employed emotional arguments; the proportion of these segments was the same after negatively or positively framed scenarios were displayed to the subject (56 %: see Table 3).

Table 3

| | Scenario | |
|---|---|---|
| | Negative framing | Positive framing |
| Discourse segments with emotional content | 52 (57%) | 47 (56 %) |
| Discourse segments without any emotional content | 39 | 37 |
| Total | 91 | 84 |

## Qualitative analysis

We now go deeper into the analysis of the persuasion strategies applied by our subjects. The main goal (the claim) of the persuasion message was to *recommend the activity* by acting on the intention to perform it: IntToDo(R p). This goal could be achieved with the combination of different techniques:

1. by attempting to *increase the desirability of the outcome:* target (V-Goal R q) but also (A-Goal R q);
2. by attempting to *remind information about activity-outcome relationship:* target (Bel R (Do(R,p)→ ◊q));
3. by attempting to *prove that conditions hold to make the activity*; target: Bel R CanDo(R,p).

Table 4 shows an example message from our corpus. This text is very simple[1]: it is a nearly purely rational message. In the generality of cases, other items were added to this basic scheme, with different purposes:

*a. increase the desirability of the goal:*

...you pretend you care for your health! ...

...a person like you, who cares considerably for her health!

...you, who care so much for your shape and health!

…and so on.

[1] All texts are translated from Italian: we apologize with our subjects for the bad translation of their very rich texts!

*b. prove that conditions hold to make the activity:*

...as you have time at your disposal

...you may find some excellent vegetables and fresh fruits…

In addition, other segments were aimed specifically at evoking the *cognitive dissonance* in Mary's mind:

...And you, who care so much for being well, you don't think to that?

...I'm surprised Mary! You spend hours in front of the mirror, you buy the last inventions of cosmetics and ...

Table 4: an example message

| | |
|---|---|
| DS1 | *Mary, I believe you should eat more fruit and vegetables.*<br>Purpose: *recommend the activity.*<br>Target: IntToDo(R p) |
| DS2 | *Since you practice sport, you should know that vegetables are good for health! They strengthen muscles and bones because they are rich in minerals.*<br>P**urpose**: *remind information about activity-outcome relationship.*<br>**Target**: Bel R (Do(R,p)→ ◊q))<br>The rational strategy adopted is enriched by exploiting evidence about the referent which is in favour of the belief (*'by making sport, you should know…"*). |
| DS3 | *Especially making sport, a good quantity of fresh season fruit tonifies and rehydrates the body after the awful sweat!*<br>Same **purpose** and **target** as in DS2.<br>Emotional items are introduced in the style (*'fresh season fruit', 'awful sweat': 'faticaccia', in Italian* ) |
| DS4 | *Without counting the benefits of vitamins A and C for skin and hair!*<br>Always the same **purpose** and **target** |
| DS5 | *Maybe you might get rid of some portion of meat or sweets, to leave more space to fruits and vegetables!*<br>**Purpose**: to suggest a plan to implement the activity. |

According to Festinger (1957), cognitive dissonance originates from inconsistency in the set of cognitive items (goals, beliefs, intentions, emotions etc) held by a person. The existence of dissonance, being psychologically uncomfortable, motivates the person to reduce it and leads to avoid information likely to increase it (Harmon-Jones and Mills, 1999). Dissonance is aroused whenever a person engages in an unpleasant activity to obtain some desirable outcomes. The persuasion process may aim at reducing it by *increasing the desirability of the outcome* and/or by *reminding information* (which was unknown or avoided) *about the activity-outcome relation* (and we saw some examples of discourse segments with this goal). In addition, as it has been claimed that *evoking the dissonance* may produce a motivation that results in genuine cognitive changes, making specific reference to inconsistency between the referents' beliefs and goal and their behaviour may strengthen the persuasion power of a strategy.

'*Rational*' *and* '*a-rational' arguments* may be employed to produce the mentioned effects. The combination of the various factors produces a large variety of 'artifices' whose validity depends on the specific situation. Very few of the messages in the corpus were formulated according to the 'nearly-rational' scheme. This occurred primarily when the persuader's background was scientific: in particular, computer scientists are champions of rationality! On the contrary, the majority of subjects with a humanistic background added other items to the previously mentioned basic techniques. Some examples:

- the *recommend the activity* section was usually introduced at the beginning of texts which tended to be rational, while it was introduced only subsequently in less rational texts, after preparing the subject to receive the suggestion. In some cases, the role of this section became so minor, that it was not mentioned explicitly but was substituted with the description of some tempting consequences of the activity:

  …a vegetable meal is not necessarily a not tasting one: with a bit of imagination, a first rate dinner for your friends may come out!

  …tomorrow you invite me at home for dinner and we only eat vegetables and fruits, OK?

  …tonight you come at home for dinner and I prepare you a nice meal with gorgeous vegetables; as a dessert, I'll make you taste a really special fruit-salad…

- the *desirability of the goal* and its *activation* may be dealt with in an emotional way:

  ...try to think, Mary, to how much more beautiful and healthy you might appear and be!

  …after a little month, you will already notice some improvement, in addition to feeling more in shape when you perform sport!

- *Proofs that conditions exist for making the activity* may be given, as well, in emotional form:

  ...you are a good cook!

  …you, who have time, may enjoy in preparing food…

  ... if one has time to arrange savoury recipes.

In addition to the techniques mentioned so far, other persuasion strategies were employed by our subjects:

- they *introduced higher-order goals* in the text, such as 'to live in a natural way', 'to satisfy gluttony', 'to enjoy', 'to make friends' that the activity might contribute to achieve:

  …you would contribute to the life of biological farmworkers

  ...you may prepare gorgeous but very light meals

  …you may always enjoy in preparing gorgeous vegetable meals

  …you will see, with my recipes cooking will be simpler and the enjoyment of eating will be more pleasant

...at the end of dinner, if you will have liked it I'll give you my recipes, so that you will prepare them as well if you wish!

... you will not see any more meals as moments in which to feel guilt for having overdone...

- they *appealed* in a more or less explicit way *to emotions*:

  ...here is the sagacity of experienced women: you have a creative intelligence on your side... *(pride)*

  ...I would be delighted to meet you and discuss pleasantly with you... *(attraction)*

  ...if you insist in not eating more fruits and vegetables, you demonstrate that you don't love yourself... *(self-estimate)*

  ...you don't wont to become enormous, do you! or ...I myself will not want to look at you any more. *(fear)*

  ... Vitamin C helps to get tanned: loot at how tanned I am! *(envy).*

## An evaluation study

This study was aimed at verifying whether the persuasion strategies included in our corpus should be considered as a mere exercise of 'artifice production' or whether they were perceived as plausible and effective means to persuade. To comparatively assess the effectiveness of some 'typical' strategies employed in our corpus, we designed, again, a web-based evaluation study:

(**http://www.di.uniba.it/intint/H-evaluation.html**)

Necessarily, we had to control the number of factors considered in the study, and therefore to simplify the strategies to compare. We decided to investigate the effect of only two factors: negative vs positive framing and rational vs emotional arguments. Our final intention was to endow a conversational agent with the ability to simulate user-adapted persuasion strategies; therefore, rather than asking our subjects to evaluate a text-based message, we prepared four videos in which a character (Alice) tried to persuade another character (her friend John) to adopt a diet including a good proportion of vegetables (see **figure 1**).

A third character (Mary), known to both John and Alice, was introduced in the story as the person from which the dieting suggestion was formulated. The videos had to be short enough to enable the study to be performed in a reasonable time (less than 10 minutes). The dialogs therefore included a few turns. The four videos varied in the persuasion strategy adopted, by combining positive vs negative framing (P/N) with emotional vs rational (E/R) arguments:

- in the *positive* cases, positive consequence of eating vegetables were described;
- in the *negative* cases, negative consequences of not eating vegetables were described;
- in the *rational* cases, Mary was presented as a dietician;
- in the *emotional* cases, Mary was presented as a girl interested to John.

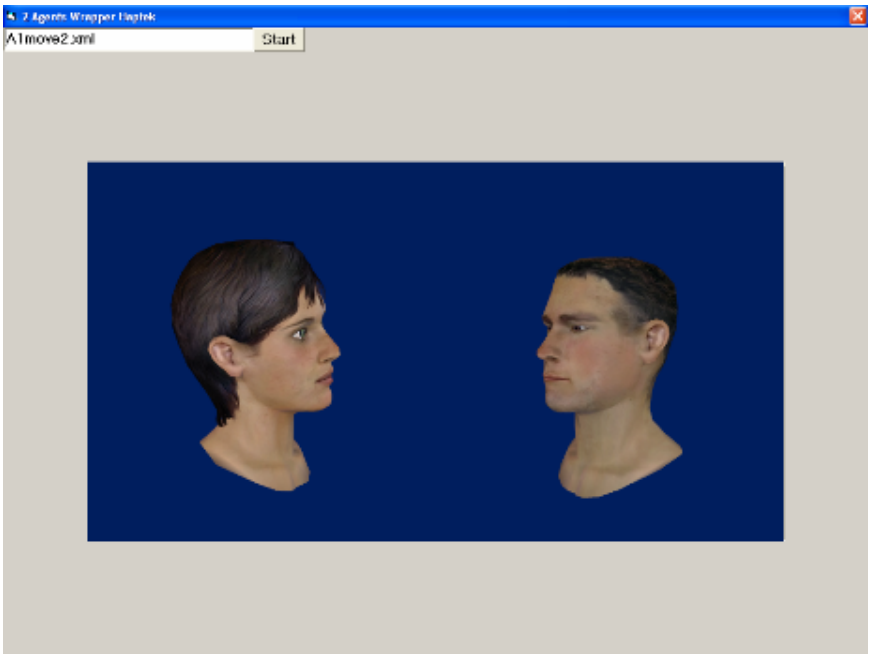


**Figure 1**: The two agents employed in the evaluation study

The following was the *emotional & positive* dialog:

==========

*Alice1: Hi John, do you remember Mary? The beautiful girl we met a couple of weeks ago in a pub! You were talking with her all the time!*

John1: Oh Mary, of course I remember her!! (*SMILE)*

*Alice2: Well, I met her yesterday and she immediately asked about you: she looked quite interested …*

John2: Really? And what did she tell you?

*Alice3: She told me that she had spent a fantastic time with you. And that you are a pleasant and interesting guy! (SMILE)*

John3: Really? So did I make a hit with her?

*Alice4: Good gracious! I would say yes! She also finds you pretty handsome. (SMILE) Did you by any chance talk about diets and eating?*

John4: Yes, but why?

*Alice5: Because she said she appreciates that you are on a diet. She liked that you are trying to reduce fats and eat more vegetables!* (*SMILE)*

John5: Really?

*Alice6: Well, I believe that you should continue this way. If she meets you in a week, she will be surprised by the perfect shape you will have taken by then!!*

John6: Ok, thanks for your suggestions!

==========

The *emotional&negative* dialog differed in the last four turns, which were the following:

==========

*Alice3: She said that you look quite out of shape, and your aspect suffers from this. Are you sure you are OK? Is there anything going wrong?*

John3: Maybe I'm a bit down, but what then?

*Alice4: But you can't go on this way ! I am sorry to tell it, but you look heavier, your colour is dull, your face is swollen SAD*

John4: And then, what should I do?

Alice5: *You could do a lot, in my view. You are eating badly! (SAD)*

John5: Why? What's wrong with my eating?

*Alice6: Your diet abounds in fats, meat and carbohydrates, while you eat almost no vegetables and fruits! You seem to disregard the basic rules of a healthy eating. If you go on this way, you will make your harm!! Think of it! (SAD)*

*John6:* Ok, thanks for your suggestions!

==========

The following was the *rational&negative* dialog:

==========

*Alice1: Hi John, do you remember Mary? The beautiful girl we met a couple of weeks ago in a pub! You were talking with her all the time!*

John1: Oh Mary, of course I remember her!! (SMILE)

*Alice2: Well, I met her yesterday and I found out… you know what's her job? she is a dietician.*

John2: Really? And what did she tell you?

*Alice3: She told me about her studies in food science. She has just been working in an important research study about food and health.*

John3: Really? So did she tell you about results?

Alice4: *Oh yes! They once again demonstrated how not eating fruit and vegetables is bad for health and beauty and makes you get old earlier (SAD)*

*John4:* So, what should one do?

Alice5: *You could do a lot in my view. You should not go on by eating no fruit and vegetables . (SAD)*

*John5:* Why so much of fruit and vegetables?

Alice6: *Because if you eat no or little fruit and vegetables, blood cleaning and tissue regeneration are slower, and this has bad consequences on your skin and hair, your look, and your general health. (SAD)*

*John6:* Ok, thanks for your suggestions!

==========

The *rational&positive* dialog differed in the last three turns, which were the following :

==========

*Alice4: Oh yes, quite interesting! They once again demonstrated how eating fruit and vegetables is good for health and beauty and helps you stay young (SMILE)*

John4: Yes, but why?

*Alice5: Because eating two portions of fruit and vegetables per meal favours blood cleaning and tissue regeneration. (SMILE )*

John5: Really?

*Alice6: Well, I believe that you also should eat more vegetables and fruit. Your skin and your general health would improve a lot.*

John6: Ok, thanks for your suggestions!

==========

The four dialogs included the same number of moves and were of the same duration. Emotional agents' expressions (SMILE and SAD in the two previous examples) were introduced so as to equally balance them in the four cases.

A final questionnaire asked the subjects to evaluate separately, with a Likert scale from 1 to 4, the agent's expression (How much did you like the agent's performance?) and the dialog content (If you were in John's shoes, would you be persuaded by Alice's words?). Two open questions enabled them to justify their evaluations.

## Results of the Evaluation Study

We collected, overall, *39 questionnaires* (equally distributed among the four modalities), from subjects with a background in computer science. Main results are shown in Table 5. The characters' expressivity received, on the average, a higher rating than the dialog content, the main limit being found in the lack of expressivity of John. This was a feature we had introduced on purpose, to avoid the risk that John's answers and facial expressions might influence the subject's evaluation of the message.

Table 5

| | Average rating | |
|---|---|---|
| | Characters' expressivity | Dialog content |
| Emotional & positive dialog (EP) | 2.8 | 2.4 |
| Emotional & negative dialog (EN) | 2.1 | 1.9 |
| Rational & positive dialog (RP) | 2.5 | 2.0 |
| Rational & negative dialog RN) | 2.8 | 2.0 |
| Total | 2.5 | 2.1 |

The 'emotional and positive' version of the dialog was considered as the most persuasive on the average, the other three versions being equivalent. In interpreting these results, it should be noticed that a rating equal to 2 corresponds to answering 'little' to the question: "*If you were in John's shoes, would you be persuaded by Alice's words?*": and, in fact, very few subjects answered 'much' to this question, in the EN, RP, RN modalities. On the contrary, a rating equal to 2.4 shows that subjects were divided between answering 'little' and 'much' or even 'very much' to that question.

The main critiques to the two rational versions of the dialog were that they were considered "*too much technical*", that "*Alice used only a medical approach*", that "*people don't talk like that, unless they are lecturing*", that "*reasons employed were not enough strong*" or that "*Alice gave reasons, but not motivations*". Many subjects claimed that suggestions should be "*more tailored to the persuadee, less straightforward, more cautious*": that Alice should "*engage John in the discussion, hear what he thinks*".

The only critique to the 'emotional and positive strategy was that it was '*too obvious*', that "*Alice was too patently trying to convince John to be interested in the other girl*". Turning the emotional version of the dialog into negative terms, however, raised quite negative comments: the scenery presented was seen as 'terrible', Alice was seen as 'violent' towards John, and her critical attitude as 'bluntly'. The expected result was that John would become 'angry and defensive', and would stop listening.

Overall, in spite of the limited size of the study, this evaluation study confirmed the preference of non specialists in health promotion and dieting for a positive rather than a negative framing approach to persuasion. Consistently with the corpus analysis, it showed, as well, that purely rational argumentation was not seen as an effective method to persuade subjects in the domain of healthy eating, and that incorporating emotional issues and tailoring the message to the characteristics of the recipient was considered as a more promising strategy.

These results are consistent, in part, with the previous studies on the difference between positive and negative framing. These studies proved that a positive attribute framing produces evaluations 'more favourable' than a negative framing, probably because it promotes the selective attention to positive aspects of the object or the event described and these produce, in their turn, access to positive associations (Levin et al, 1998). A contrary effect was observed for goal framing: in this case, several studies (for instance, Meyerowitz and Chaiken, 1987) demonstrated that negative messages have a stronger persuasion impact than positive ones, for what Tversky and Kahneman called 'loss aversion' (1981): that is, for individuals' reluctance to tolerate a loss, which would be higher than the desire to get a gain of the same entity.

In a previous study, in which we contrasted positively framed with negatively framed monologs about healthy eating, the negative message was perceived as a bit more credible by our subjects. On the contrary, the quality of arguments employed was perceived as being a bit higher for the positive message, which was considered to be more trustful (Berry et al, 2005; de Rosis et al, 2006).

## Knowledge representation

Recent work on argumentation theory (Kienpointer, 1992; Walton, 2005) influenced considerably research about application of AI techniques to the simulation of argumentative dialogue games. As usually happens in science, there is now a growing interest towards validating whether this theory applies successfully to formalizing argumentation of various sorts and in various application domains. Some variants of Walton and Reed's argumentation schemes (2002) are being proposed, for instance to represent 'values' in practical reasoning (Atkinson et a, 2004).

In the Qualitative Analysis Section, we described and exemplified some of the strategies that were applied by our subjects in their persuasive texts. Some of these texts, that we categorized as referring to the 'nearly purely rational strategies', may be formalized quite easily with Walton's schemes, to which some bits of emotion may be introduced by adopting a 'rich' language style. We found, on the contrary, much more difficulty in translating into a chaining of Walton's schemes the texts in which emotional strategies were applied. We will here consider three examples, and will try to give our tentative answer to this problem: a*ppeal to cognitive dissonance, appeal to a friend's personal experience* and *appeal to the goal to feel a particular emotion.* We will propose a revision of some of Walton's schemes which enables representing these strategies.

### a. appeal to cognitive dissonance

As said before, cognitive inconsistency is seen, by several psychologists, as an uncomfortable state; it is claimed that evoking the dissonance may produce a motivation to induce the person to reduce it. Therefore, the persuasion power of a strategy may be strengthened by making specific reference to the inconsistency between the

referents' beliefs and goals and their behavior. Let us consider again an example from our corpus:

Ex1.
*"I'm surprised Mary! You spend hours in front of the mirror, you buy the latest innovations of cosmetics, you have a mania for fitness,…and then I discover that you don't eat fruit and vegetables… Come on!"*

In this text, the persuader P lists some evidence proving that the recipient R is committed to 'being in shape' (the proposition A): R should therefore support A. P then implicitly claims that 'eating fruit and vegetables' is a way to achieve A and that R should therefore support it as well. This kind of argumentation strategy might be represented by combining Walton's scheme of *Argument from Commitment* with some other scheme (e.g., *Argument from Evidence*). We remind here Walton's original scheme:

Walton's Argument from Commitment
PREMISE: R is committed to proposition A
CONCLUSION: In this case, R should support A
CQ1: Is R really committed to A, and if so, what evidence supports the claim that she is so committed?
CQ2: If the evidence for commitment is indirect or weak, could there also be contrary evidence, or at least room for the rebuttal that this case is an exception?
CQ3: Is the proposition A cited in the premise identical to the proposition A cited in the conclusion? If not, what exactly is the relationship between the two propositions?

Alternatively, the strategy might be represented with a revised instance of Walton's *Argument from Waste:*

Walton's Argument from Waste
PREMISE: If a stops trying to realize A now, all R's previous efforts to realize A will be wasted
PREMISE: If all R's previous attempts to realize A are wasted, that would be a bad thing
CONCLUSION: R ought to continue trying to realize A
CQ1: Are R's attempts to realize A really a negative value to be taken into account in any practical decision on what to do now, or are they simply past events that can no longer be changed?
CQ2:Is there sufficient reason to think that if R continues, A will be realized? In other words, is A possible?
CQ3: Is there good reason to think that, from this point, the value of realizing A is greater than the disvalue (cost) of continuing the process of attempting to realize A?

In the first case, the scheme would emphasize consistency of behavior; in the second one, saving of efforts. We believe that the first alternative better suits the goal of evoking cognitive dissonance, and therefore propose the following new scheme:

Argument from Consistent Commitment
PREMISE: consistency is a value to R
PREMISE: A1, A2, … An are all signs of R's commitment to G
PREMISE: R knows that An+1 is an important mean to achieve G
PREMISE: R does not make An+1
CONCLUSION: R should feel uneasy about not making An+1
CQ1: is consistency really a value to R?
CQ2: Is G really important to R?
CQ3: Is R really committed to A1, A2,…An?
CQ4: Is R committed to A1, A2,…An because of G, or for other reasons?
CQ5: Is An+1 really important to achieve G or does it contribute minimally to this goal?
CQ6: Is the proposition An+1 cited in the premise identical to the proposition An+1 cited in the conclusion? If not, what exactly is the relationship between the two propositions?

**b. appeal to a friend's personal experience**

The hypothesis of friendly relationship with the persuadee (Mary) was taken by some subjects as a key factor in formulating a particular kind of 'appeal from position to know'. Let us consider the text: *"I tested on my skin the benefits of these simple and health foods"*. This may be seen as an *Argument from position to know*, in Walton's theory, in which the person a is, in particular, the persuader:

Walton's Argument from Position to Know
PREMISE: a is in a position to know whether A is true (false)
PREMISE: a asserts that A is true (false)
CONCLUSION: A is true (false)
CQ1: Is a in a position to know whether A is true (false)?
CQ2: Is a an honest (trustworthy, reliable) source?
CQ3: Did a assert that A is true (false)?

However, we believe that the strategy applied in the previous example adds some 'emotional strength' to persuasion, due to the friendship relationship between the person who is 'in the position to know' and the recipient. If combined with conditions about honesty of the source, this relationship increases its believability. We therefore propose the following revised version of Walton's scheme:

Argument from Friendly Position to Know
PREMISE: Q (who may be also P) is in a position to know whether A is true (false)
PREMISE: Q is a friend of R (or is in some other type of 'empathic' social relationship with R)
PREMISE: Q asserts that A is true (false)
CONCLUSION: A is true (false)
CQ1: Is Q in a position to know whether A is true (false)?
CQ2: Is Q really a friend of R (or does really R feel empathy to Q?)
CQ3: Is Q an honest (trustworthy, reliable) source?
CQ4: Did Q assert that A is true (false)?

Figure 2 shows the argumentation scheme of our example Ex1, which was drawn with Araucaria (Read and Rowe, 2001). In this example, we introduced some premises that we believe were left implicit in the message and applied our Arguments 'from Consistent Commitment' and 'from Friendly Position to Know'.

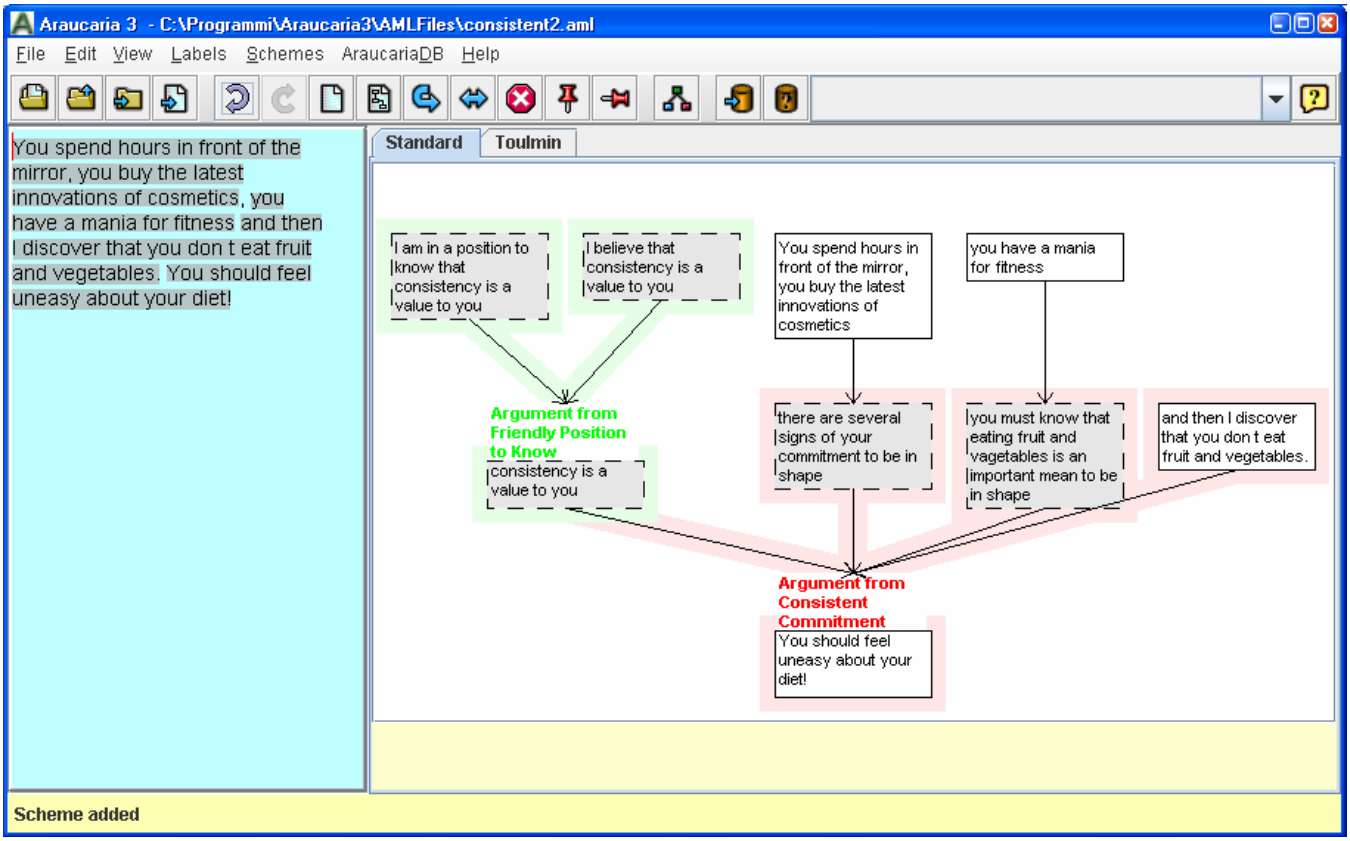


**Figure 2:** The argumentation diagram of our example.

### c. appeal to the goal to feel a particular emotion

Let us finally consider the following example: "*A correct diet, rich in vitamins, minerals and calcium, combined with a regular physical exercise, is ideal to be in shape*". This is an example of 'purely rational' persuasion, which may be formalized with Walton's argument from consequences:

Walton's Argument from Consequences
PREMISE: If A is brought about, then good (bad) consequences will (may plausibly) occur
CONCLUSION: A should (not) be brought about
CQ1: How strong is the likelihood that these cited consequences will (may, must, etc.) occur if A is brought about?
CQ2: Are these consequences really good (bad) for the recipient?
CQ3: Do conditions exist to bring about A?
CQ4: Are there consequences of the opposite value that should be taken into account?

This scheme enables introducing in practical reasoning emotional strategies of 'fear appeal' or 'hope appeal'. Let us, however, consider the following text: *"I would be delighted to meet you and discuss pleasantly with you!"*. In this case, as we said in Section 2, the goal the Recipient is induced to achieve is 'to feel an emotion' (in the example, 'pleasure', or 'feeling attractive') rather than a rational goal like 'being in shape'. We claim that, to represent the goal to feel (or to avoid feeling) a broader range of emotions than fear or hope, an extension of Walton's scheme is needed. For instance:

Argument from Emotional Consequences
PREMISE: If A is brought about by R, then the positive (negative) emotional consequence E will (may plausibly) occur
PREMISE: R is sensitive to feeling (avoid to feel) E
CONCLUSION: A should (not) be brought about by R
CQ1: How strong is the likelihood that the cited emotional consequences will (may, must, etc.) occur if A is brought about, for a recipient with the given characteristics?
CQ2: Is the recipient really sensitive to feeling/not feeling these emotional consequences?
CQ3: Do conditions exist to bring about A?
CQ4: Are there consequences of the opposite value that should be taken into account?

As proposed in a previous paper, belief networks (Pearl, 1988) are considered as an appropriate formalism to represent the various sources of uncertainty in the persuasion process, the graduality of persuasion and the difference in the strength of a given argument for different receivers (Green, 2003; Carofiglio, 2004). We could verify, with our study, that representing uncertainty is even more essential when emotional strategies are applied: in fact, the emotional strength of friendship relation, the emotional impact of feeling cognitive dissonance and the

value given to the goal to feel emotions like pride, pleasure etc are much variable from subject to subject: uncertainty representation and adaptation to the recipient's presumed personality and scale of values are therefore a need.

## Conclusions

In this paper we described how we collected and analyzed a corpus of persuasion texts in the domain of healthy dietary behavior. With this analysis, we wanted to single out the basic strategies that were adopted by our subjects in producing a persuasive text: the preliminary results we got proved that positive arguments were preferred to negative ones, that purely rational strategies were employed very infrequently and that emotional elements could be found in almost every message, in various forms. We then compared, in an evaluation study, the persuasion strength of some of these strategies by examining, in particular, the role of (positive vs negative) framing and appealing to emotional vs rational factors. Emotional dialogs employing positive arguments were seen as the most persuasive, although adaptation to the recipient's characteristics was suggested as a key factor to insure effectiveness of the strategy. We are aware of the limits of our work, due to including in our studies laypeople rather than counselors or therapists. However, as we said, the final goal of our research is to build a conversational character which provides suggestions in this domain: we believe that such a character might hardly be seen as a substitute of the therapist. It might rather play the role of a 'competent friend', who knows about the addressee and exploits this knowledge to select a promising strategy to get the desired effect.

## Acknowledgements

This work was financed, in part, by HUMAINE, the European Human-Machine Interaction Network on Emotion (EC Contract 507422). We thank Maria Miceli and Isabella Poggi for giving us useful suggestions on how to analyze the corpus data and how to formulate the dialogs for the evaluation study.

## References

Atkinson, K., Bench-Capon. T., and McBurney, P. 2004: Justifying practical reasoning. *Proceedings of the* Workshop on *Computational Models of Natural Arguments* (CMNA'04).Valencia.

Berry, D.C., Butler, L.T. and De Rosis, F. 2005: Evaluating a realistic agent in an advice-giving task. *International Journal of Human-Computer Studies 63:304-327.*

Carofiglio, V. 2004: Modeling argumentation with belief networks. *Proceedings of the Workshop on Computational Models of Natural Arguments* (CMNA'04).Valencia, Spain

de Rosis, F., Cavalluzzi, A., and De Carolis,. B. 2006: Interazione affettiva con agenti animati. *Cahiers Romans de Sciences Cognitives*. ISSN 1267-8015. N.2.

Festinger, L.1957: *A theory of cognitive dissonance*. Evanston, IL.

Green, N. 2003: Towards an empirical model of argumentation in medical genetics. *Proceedings of the Workshop on Computational Models of Natural Arguments*.

Grosz, B. and Sidner, C.1986: Attention, intentions and the structure of discourse. *Computational Linguistics*, 12, 3.

Harmon-Jones, E. and Mills, J.1999: Cognitive dissonance: progress on a pivotal theory in social psychology. Americal Psychological Association Books.

Kienpointner, M. 1992: How to Classify Arguments. In F.H. van Eermeren, R.Grootendorst, J.A.Blair, and C.A.Willard (Eds.), *Argumentation Illuminated*.

Levin,I.P., Schneider, S.L.,and Gaeth,G.J. 1998: All frames are not created equal: a typology and critical analysis of framing effects. *Organizational Behaviour and Human Decision Processes.* 76, 2, 149-188.

Meyerowitz, B.E. and Chaiken, S. 1987: The effect of message framing on breast self-examination: attitudes, intention and behaviour. *Journal of Personality and Social Psychology*. 52, 500-510.

Miceli, M., de Rosis, F. and Poggi, I.: Emotional and non emotional persuasion. *Applied Artificial Intelligence: an International Journal*. In press

Pearl, J. 1988: *Probabilistic Reasoning in Expert Systems: Networks of Plausible Reasoning*. San Mateo, CA: Morgan Kaufmann (Pubs.).

Reed, C. and Rowe, G. 2001: Araucaria. Software for puzzles in argument diagramming and XML. *Department of Applied Computing. University of Dundee, Technical Report*.

Rosselli, F., Skelly, J.J., and Mackie, D.M. 1995: Processing rational and emotional messages: the cognitive and affective mediation of persuasion. *Journal of Experimental and Social Psychology*. 31, 163-190.

Tversky, A. And Kahneman, D. 1981: The framing of decisions and the psychology of choice. *Science*. 211, 453-458.

Walton, D. N. 1992: The place of emotion in argument. *The Pennsylvania State University Press*.

Walton, D.N. and Reed, C.A. 2002: Argumentation schemes and defeasible inferences. In G.Carenini, F. Grasso, and C.A. Reed (Eds.), *Working Notes of the ECAI'2002 Workshop on Computational Models of Natural Argument*, Lyon.

Walton, D.N. 1996: Practical reasoning and the structure of fear appeal arguments. *Philosophy and Rhetoric*. 29, 4.

Walton, D.N. 2005: How to evaluate argumentation using schemes, diagrams, critical questions and dialogues. *Scoms: Argumentation in Dialogic Interactions.* 51-74.