



# 'What matters to Andrew'. The problem of premissary relevance in automated health advisors. Insights from pragma-dialectics

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## ABSTRACT

**Objective:** To influence health behavior, communication has to be relevant on an individual level and, thus, fulfill the requirement of premissary relevance. This paper attempts to enrich the design of automated health advisors by, first, reviewing main solutions to the challenge of premissary relevance found in the literature and, second, highlighting the value in this field of the theory of argumentation known as pragma-dialectics.

**Methods:** A conceptual paper grounded in persuasion research and argumentation theory.

**Results:** Automated health advisors enable argumentative exchanges with users. But there is a need to design these systems as to make them work in an audience-centered perspective. The theory of pragma-dialectics can be used to analyze the factors that favor or hinder the agreement of users to engage in certain health behaviors, and to identify argumentation strategies targeted to behavior change.

**Conclusion:** Pragma-dialectics can be used to enhance the design of automated health advisors as it operationalizes the dialogical nature of the reasoning process that can influence health behavior.

**Practice implications:** Premissary relevance is a challenge of communication for health promotion at large that can be promisingly addressed through synergies among persuasion research, argumentation theory and Artificial Intelligence.

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## 1. Introduction

Imagine the following case. Andrew is a doctor. As part of his background, he knows all the medical reports and evidence on the risks associated with smoking, and he knows a great deal about techniques to quit smoking. Nevertheless, he is a smoker and has never had any intention of giving up because, as he says, it helps him relax. How is it possible to convince Andrew to at least start to consider quitting? People like Andrew pose particularly critical challenges to the design of health promotion interventions, especially when these interventions take the form of an automated health advisor.

According to Kraus [1] and a large part of the literature on persuasion, influencing behavior presupposes a change in individuals' attitudes. Andrew's positive attitude toward smoking prevents him from actually quitting and it is this attitude that must be changed. But how to do this?

Rubinelli and Schulz [2] argued in favor of an approach toward attitude change based on the use of argumentation. A promising way to enhance change is, indeed, to engage with the target-person in an argumentative exchange that focuses on those beliefs that, according to belief-based models of attitude [3], are responsible for attitude formation and to attempt to modify them according to the expected outcome (i.e. to consider giving up smoking). The fact that Andrew has a positive attitude toward smoking is the result of a set of positive beliefs about it (e.g., "Smoking helps me relax"). These are the beliefs that one would need to modify. But how?

Belief-based models of attitude suggest that, at any given time, only some of an individual's beliefs are likely to be salient and it is those that are claimed to determine one's attitude [3–5]. This points to at least four main strategies that can be used to influence an attitude: first, one can lead the receiver to add a new salient belief with the desired evaluation (e.g., one might try to instill the belief that "Smoking ruins the teeth"); second, one may change the evaluation of an existing salient belief (e.g., if Andrew believes that smoking helps him relax, one might try to convince him that that is not all that desirable an outcome); third, one may change the strength with which an existing salient belief is held (e.g., one might try to increase Andrew's perception of the likelihood that smoking will cause respiratory problems); and fourth, one may try

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to change the relative salience of existing beliefs such that the more salient beliefs are the ones with the desired evaluation (e.g., one might remind Andrew about the expense of smoking). In an argumentative framework this means that it is possible to advance premises that are either in favor of the individual beliefs one wants to add or reinforce, or against the individual beliefs one wants to refute. Here lies the core of the challenge.

Whatever strategy is applied, in order to be successful in an argumentative exchange speakers must use contents that are relevant for Andrew and can, thus, become salient in promoting his attitude change. Here, the key concept is that of premissary relevance [6]. While relevance can also refer to the fact that certain contents have to do with the standpoint at issue, the term premissary relevance is here used in the sense that content used to support a certain standpoint (i.e. the premises of a standpoint) is relevant if a given interlocutor will accept it as an adequate support of that standpoint [6]. The main question is how to select content that will be accepted by Andrew. As also acknowledged by the Elaboration Likelihood Model [7], in fact, the relevance of content at a personal level is a key factor for people to engage in critical thinking about their beliefs and reasons at the origin of a behavior.

The objective of this paper is to advance the design of automated health advisors argumentation systems by, first, critically reviewing what solutions to the challenge of premissary relevance can be found in the literature and, second, highlighting the value in this field of a theory of argumentation known as pragma-dialectics [8–10].

## 2. Methods

This paper presents a conceptual analysis of premissary relevance in the context of automated advisors for health promotion by relying on the theories and models of persuasion research [11], argumentation theory [12] and, more specifically, pragma-dialectics [8–10].

## 3. Results

### 3.1. Catching what matters to individuals

Results from persuasion research have highlighted some main theories that can guide speakers in the search for potentially relevant contents. According to Fishbein et al. [4,5] there are three main social influence theories that can be utilized to identify and address the causes of Andrew's smoking habit:

*Health belief model*, which assumes that the salient beliefs are those resulting from an individual's rational appraisal of the risks, benefits and barriers to action (e.g., "Smoking can be bad, but at the moment it is more important that it helps me relax");

*Social cognitive theory*, which acknowledges the influence of individuals' social environment. It is a learning theory, based on the idea that people learn by doing what others do and that salient beliefs can result by conforming to this (e.g., "All my friends smoke");

*Theory of reasoned action* (TRA), which proposes that one's intention to perform or not perform a given behavior is a function of two factors: one's attitude toward the behavior in question and one's subjective norm, i.e. the perception of whether important others desire the performance or nonperformance of the behavior (e.g., "I continue smoking because I like it and despite the fact that my wife complains about it all the time"). An extension of the TRA is represented by the *Theory of Planned Behavior* (TPB), which introduces a third predictor of behavior, namely a person's perceived ability to perform or control a behavior (e.g., "I know

that smoking is bad, my family complains a lot about my habit, but I can't quit. I tried, but I can't").

Thus, beyond strictly scientific data about the risks associated with smoking, there are several premises which can be used to address and influence possible factors that are responsible for Andrew's habit. But, again, how can speakers know which of the proposed theories will capture Andrew's individuality? There is the need for an interpersonal exchange with Andrew where he discloses what is at the origin of his habit, or he gives hints to understand it.

So far, one of the most promising ways to capture the individuality of a person in the perspective of designing an ad hoc health promotion intervention is known as Tailoring Health Communication (THC) [13]. THC has been developed in an attempt to avoid the pitfalls that have compromised the effectiveness of previous mass-media based approaches, in particular the selection of a single communication approach to use with a group of people just because they share a particular characteristic. Tailored health communication is based on an individual level assessment and hence enables a high individualization of communication. At the same time, it can potentially reach large populations. Scholars working on tailoring health communication with computer technology suggest that one first identifies through a questionnaire those factors most likely to influence a person's motivation or ability to make whatever changes in behavior are necessary to accomplish the program's goals. Once these factors have been identified, it is possible to measure an individual's status on each of these factors and, subsequently, tailor a message to each person's unique needs based on this information.

Tailored health communication has been proven to be successful [14–16]. Yet, automated argumentation advisors could propose a more refined way of tailoring health communication, with potentially even a higher impact. Current THC has, indeed, two limitations that could be improved: firstly, it is not a natural way of interaction. Individuals who are in the target group of a THC intervention must answer a questionnaire that investigates their personal values, cultural norms, and social networks. When people are asked to fill out this type of questionnaire they are, to some extent, forced to think about everything that could be relevant to change behavior. Secondly, current THC does not enable argumentation in the sense of a critical discussion aimed to resolve a difference of opinion. As mentioned earlier, whenever there is a need to change salient beliefs or to add new beliefs and make them salient, argumentation is valuable. In the majority of cases, differences of opinion are solved by means of conversations, or argumentative discussions which are aimed at addressing the individual's beliefs, attitudes, and standpoints related to the health behavior at issue.

Automated argumentation advisors do hold the promise of enabling such an argumentative exchange through naturalistic dialogue with the persuadee. But fulfillment of this promise is still some way off. The interest for argumentation theory and practice in the field of Artificial Intelligence is clear [17,18]. However, some of the work in Artificial Intelligence that uses insights from argumentation theory has been based on models of formal logic and focuses on the validity of arguments [18]. This emphasis is crucial in theoretical reasoning where agents try to make their beliefs fit the world. But to design an automated argumentation advisor in the context of health promotion, theories of argumentation are needed that, apart from looking at validity, focus on the dialectical dimension of a critical discussion. That is, a foundation is needed that emphasizes the interaction taking place between two discussion parties.

Some research in Artificial Intelligence has been dedicated to the design of automated argumentation advisors that are not based on formal logical principles. Systems have been developed

beginning with an abstract representation of alternative persuasive strategies, as in Guerini et al.'s PROMOTER system [19], which takes into account a variety of recipient states (beliefs, desires, intentions, and so forth). Other systems, in particular the PORTIA system presented by Mazzotta [20,21], have been built on a corpus of naturally-produced persuasive messages and attempt to derive a set of strategies [20,21]. Specifically in the field of health promotion, attempts have been made to apply a theoretical perspective such as the trans-theoretical 'stages of change' model [22] to a corpus of relevant dialogues so as to build user models which then contribute to agent models [23]. Grasso et al. conceptualize the DAPHNE advisor that, again, attempts to move the users from one stage to the other of the transtheoretical model – in the context of nutritional lifestyles – by exploiting argument schemes found in the New Rhetoric [24,25]. A similar system – but in the field of smoking cessation – is STOP [26,27]. In the context of psychotherapy, De Boni et al. propose an argumentative advisor based on the Rational-Emotive Behavior Therapy (REBT), developed by Ellis et al. and focus on changing eventual misleading beliefs that, according to this theory, act as barriers toward the adoption of beneficial behavior [28,29].

All the above mentioned studies offer a promising starting point for the development of systems that work through an audience-centered approach. Yet, there is a need to exploit the value of other theories of argumentation that consider the interactional exchange among interlocutors. This paper suggests that the theory of argumentation known as pragma-dialectics [8–10] can be a valuable framework for addressing the challenge of premissary relevance in the design of automated argumentation systems of health promotion. As explained below, pragma-dialectics offers a heuristic tool for the reconstruction of argumentative discourse as well as an evaluative tool for its critical assessment: it focuses on the audience dimension and provides insight into the way an arguer can select content that has personal relevance for the individual to be convinced.

### 3.2. Constructing argumentation through pragma-dialectics

In the pragma-dialectical theory of argumentation, argumentative discourse is studied as part of a critical discussion that is essentially aimed at resolving a difference of opinion. The theory starts from an ideal model that specifies the stages of a resolution process and the various speech acts that are instrumental at each of these stages to resolve a difference of opinion in a reasonable way. The theoretical definition of a critical discussion is formed by a set of ten discussion rules, which constitute a code of conduct for a reasonable discussion procedure [8]. Any violation of these rules is considered a hindrance to the resolution-oriented character of the discussion process and is considered a fallacious move of argumentation.

In pragma-dialectics it is assumed that the discussion parties involved in a critical discussion – a protagonist and an antagonist – ideally strive to conclude their difference of opinion by engaging in a critical testing procedure in which they aim to weigh the arguments advanced by each of the parties involved and as such test the acceptability of a standpoint. Taking a pragma-dialectical approach, the implicit dialog between the health campaigner and smoker Andrew in the opening example can be reconstructed as such a critical discussion concerning the standpoint 'Andrew should quit smoking'. In order to convince Andrew (the anticipated antagonist of the standpoint) to quit smoking, the health campaigner (taking up the role of the protagonist) must advance arguments to support the advocated behavior change. Doing so, the health campaigner must make use of arguments that are personally relevant to Andrew.

Pragma-dialectics conceptualizes argumentation as a dialogical process and presents an instrumental norm that allows for a distinction to be made between those argumentative moves that contribute toward the resolution of a dispute and those that hinder this process. The theory provides a clear account as to what is argumentatively relevant in order to resolve the dispute, and what is not.

The pragma-dialectical model of critical discussion seems particularly useful for the purpose of designing automated health promotion advisors because it provides a stage-based analysis of argumentative discourse. In a pragma-dialectical approach, argumentative discussions can be reconstructed to consist of four stages – a confrontation stage, an opening stage, an argumentation stage, and a concluding stage – each of which serves a specific purpose in the resolution process [8]. In the confrontation stage, interlocutors establish that they have a difference of opinion. In the opening stage, they decide to resolve this difference by agreeing upon certain rules of discussion and establishing the agreed starting points of departure. In the argumentation stage, the actual argumentative exchange takes place. In the concluding stage, the interlocutors evaluate to what extent their initial difference of opinion has been resolved. For each of these stages, the various speech acts that are instrumental for the resolution process can be specified and potential hindrances can be identified.

A stage-based model of argumentation can provide fruitful when aiming to catch what matters to individuals. Following pragma-dialectics, the material point of departure for the discussion is determined at the opening stage. What premises do both parties agree upon already beforehand (e.g., "Smoking may cause lung cancer") and which premises still need to be negotiated (e.g., "Smoking gives you bad breath")? It is at this stage that a health campaigner may aim to widen the 'zone of agreement' as such that he creates the most favorable starting point for his argumentation. In order to do so, the health campaigner may, for example, strive to elicit explicit concessions from our smoker Andrew and build forth on these concessions in his subsequent line of argumentation.

Overall, the challenges of designing automated systems capable of recognizing the various stages of discussion should not be underestimated. In argumentative practice, discussions typically do not progress in a rigid sequence. Instead, discussants can move back and forth between the different stages in particularly complex ways. In order to reconstruct the various stages of a critical discussion, linguistic markers provide useful cues. Linguistic indicators may signal, for example, the advancement of a standpoint, the establishment of common starting points, the provision of argumentation, or the conclusion of the discussion [30].

The normative conception that discussants ideally strive for dialectical reasonableness in order to resolve their differences of opinion may seem far removed from an argumentative reality in which arguers typically also strive for rhetorical success and, moreover, in which actions can be the result of irrational considerations. Therefore, a health campaigner will want to provide argumentation that is not only reasonable but also effective in order to convince its audience. In pragma-dialectics, the balancing act between striving for persuasiveness while remaining within the bounds of the reasonable is referred to as strategic maneuvering [31]. Such strategic maneuvering can be viewed as a form of individual tailoring to the antagonists' unique, argumentative needs – both from the perspective of dialectical reasonableness and rhetorical effectiveness. Three modes of maneuvering can be distinguished: (1) making an opportune selection from the potential of all argumentative moves available at a given moment, (2) adapting to the intended audience as much as possible, and (3) a presentational means that is particularly

appealing. For example, when tailoring the argumentation to Andrew's personal needs, a health campaigner may choose the arguments that are particularly relevant for Andrew (i.e., focusing on 'avoiding bad breath') and present them in such a way that is likely to be effective (i.e., emphasizing potential lack of attractiveness). In establishing the most relevant argumentative topics, use can be made of theoretical models such as the health belief model, social cognitive theory, and the theory of reasoned action. In doing so, information concerning Andrew's attitudes toward behavior, his behavioral intention, the perceived risks and benefits, and the subjective norms may be elicited. But also Andrew's past and present behavior, his socio-demographics and medical (smoking) history, his concessions, implicit commitments, and explicit statements should be considered in order to distil starting points.

A question that has remained unanswered so far is why a health campaigner would opt for a dialectically reasonable process of argumentation, while he could instead choose to strive for rhetorical success only, regardless of the (reasonable versus fallacious) quality of argumentation. Recent studies have shown that reasonable argumentation in a pragma-dialectical sense is not only recognized as such by ordinary language users, but also generally perceived to be more persuasive than fallacious argumentation [32,33]. Consequently, striving for a rhetorically strong line of argument that, at the same time, stays within the bounds of reasonableness, seems to be a fruitful strategy for those aiming to promote health behavior change.

#### 4. Discussion and conclusion

##### 4.1. Discussion

In the field of Artificial Intelligence – where the design of automated health advisors is a prominent area of interest – the study of persuasion and its modalities is well-advanced [34]. As far as argumentation theory is concerned, the concept of argumentation is well known and studied in Artificial Intelligence in the context of argumentation machines [17,18]. The notion of premissary relevance has been developed in the field of argumentation theory and it is consistent with the ideas underlying the field of Artificial Intelligence known as 'user modeling', which has addressed the problem of gathering information about users through dialogue and making inferences about users' attitudes and other aspects from their contributions. The connection between argumentation theory and user modeling has been made previously [35].

In light of this background, the novelty of this paper lies on the analysis of pragma-dialectics and, more specifically, on the identification of those characteristics of pragma-dialectics that make it a promising approach for the design of automated advisors for health promotion. The link between pragma-dialectics and automated advisors for health promotion has so far not been explored [36,37]. Yet, Artificial Intelligence can benefit from results from the field of health communication, where pragma-dialectics has recently captured the interests of scholars in two main contexts: doctor-patient argumentation – as an aid to understand how to enhance agreement between the doctor and the patient [38,39] – and health brochures and health advertising – as an aid to identify potentially misleading types of argumentation [40,41].

##### 4.2. Conclusion

Argumentation is a promising communication process for health promotion generally and specifically for fostering behavioral change in individuals who are at risk of health conditions. Argumentation can, in fact, be used to address what matters to individuals and to confront them with those beliefs that are at the

origin of certain compliant or non-compliant behaviors. By borrowing from the field of argumentation theory, this paper has attempted to show that the concept of premissary relevance is a challenge in argumentation targeted to health promotion, and that it is of key importance to consider it in order to optimize communication targeted to behavior change. The understanding of what is relevant for an individual presupposes, on the one side, knowledge of theories of attitude formation and, on the other side, the interpersonal encounters to identify and address what matters to each person individually. The field of automated health advisors holds the promise of providing systems that can engage with people's individual beliefs. To reach this goal, however, there is a need to further develop systems that interact within an audience-centered approach. This paper has, thus, also attempted to show that the pragma-dialectical theory of argumentation offers a promising framework for the development of automated health systems as it captures the dialogical nature of the reasoning process and those aspects that enter into play in the attempt to reach rhetorical effectiveness. It goes without saying that an automated health advisor that operationalizes pragma-dialectics would also offer an ideal setting to further investigate the potential usefulness of this theory in health promotion.

##### 4.3. Practice implications

The results of this paper encourage dialog and exchange among research communities belonging to four different fields: health communication, persuasion research, argumentation theory, and Artificial Intelligence. The integration between health communication and Artificial Intelligence, as well as the study of health communication from an argumentation theory perspective, is in its infancy. But the combination of insights from these different perspectives can foster the identification of the critical challenges behind the success of health communication interventions (e.g., the challenge of premissary relevance), alongside providing instruments to address them.

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##### Conflict of interest

The authors declare no conflict of interest.

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