

# Argumentation through an Automated Rational-Emotive Behavior Therapy System For Change in Exercise Behavior

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## Abstract

We propose Rational Emotive Behavior Therapy (REBT), a very structured therapeutic approach which lends itself well to automation, as a promising argumentation technique for consumers of healthcare. In particular we describe an automated dialog system for exercise behavior change based on REBT.

## 1 Introduction

There is increasing concern over the health risks associated with rising obesity and declining physical activity levels in developed western countries (Prentice & Jebb 1995). Tate *et al* (2001 and 2003) have demonstrated the benefits of an internet-based behavioral weight loss program; Doshi *et al* (2003) evaluated a range of commercially available physical activity web sites, noting a range of user interaction level, from individually tailored assistance to general guidelines or advice. However, the literature on how to build effective automated interventions is limited (Ritterband *et al* 2003).

One possibility is to use automated dialog to engage and argue with users to convince them of the benefits of exercising more. There has been extensive research on various aspects of automated dialog systems over more than thirty years, either as generic conversational systems or for specific tasks such as getting train timetable information or booking business appointments. Little

attention has however been paid to the work carried out in fields such as psychology of persuasion and psychotherapy on what constitutes a successful dialog and what dialog argumentation strategies work best for change in the behavior of users. Our research has focused on these psychological aspects of dialog and dialog argumentation strategy, seeking to implement in an automated system dialog strategies that have been shown to be successful in psychological theory.

One such theory, which originated in the field of psychotherapy, is Rational Emotive Behavior Therapy (REBT), a dialog-based method in which therapist and client argue the rationality or irrationality of beliefs, which has been shown to be successful in changing people's behavior. We chose to take this theory for its rational argumentation structure and procedural approach (very different from the approach taken, for example in psychoanalysis) as well as its focus on specific forms of language and their impact on behavior, in comparison to similar but less linguistically prescriptive approaches such as Cognitive Behavioral Therapy. The well-defined linguistic basis of REBT makes it very attractive for automation on a computer-based system. We then implemented an automated dialog system based on this theory, integrating it within a wider exercise behavior change program.

## 2 Argumentation through Rational Emotive Behavior Therapy

Rational Emotive Behavior Therapy, developed by Albert Ellis (Ellis, 1994 and Dryden 1999), proposes that

counterproductive behaviors are largely the result of ‘crooked’ unhelpful thinking, i.e. it is not events that cause our problems but the way we think about them. Behavior change therefore occurs as a result of a change in the way we think: REBT helps bring about this change by encouraging us to argue with ourselves, recognizing unhelpful thinking as such and substituting it with more helpful thought processes.

A person’s beliefs are considered to be either ‘rational’ or ‘irrational’. Rational beliefs are flexible (often expressed as preferences, e.g. I would like), consistent with reality, have internal logical coherence and pragmatically help us towards our goals. Irrational Beliefs are rigid/dogmatic (‘must’, ‘should’, ‘ought’), inconsistent with reality, illogical and interfere with goal achievement.

REBT is based on three key insights; (1) psychological disturbance is primarily determined by the irrational beliefs we hold, (2) we remain disturbed by re-indoctrinating ourselves with our irrational beliefs, (3) in order to change we must work hard to think, feel and act against our irrational beliefs. Many also suffer from Low Frustration Tolerance, i.e. some tasks, such as increasing levels of exercise and/or resisting fatty foods, are considered too uncomfortable to bear.

The REBT approach helps people realize the irrationality of their unhelpful beliefs and then convert them into more flexible / helpful beliefs. Although primarily used within a clinical or counseling setting, REBT has also proved effective for everyday behavioral problems. For example, Block (1980) has shown the REBT approach can help people to lose weight. In our case, we are using REBT to encourage clients to change their exercise behavior, overcoming the mental barriers which are stopping them from exercising more.

We have developed an automated system that first identifies a person’s irrational/rigid beliefs and then guides in their conversion to more flexible/helpful beliefs. Argumentation is therefore indirect: the system encourages users to argue with themselves, directing them towards a more rational thinking style, helping them realize the irrationality of their unhelpful beliefs.

### **3 An automated REBT therapist for exercise behavior change**

The REBT approach moves along a rigorous sequence of steps and our system follows the same sequence:

- 1) accepting psychological responsibility for the problem,
- 2) understanding the critical role irrational beliefs play in determining the problem,
- 3) identifying realistic goals for change,
- 4) committing to achieving these goals,

- 5) recognizing that the key to achieving the goals is changing the specific irrational belief,
- 6) seeing that the rational belief is a plausible alternative to the irrational belief,
- 7) understanding that the irrational belief is inconsistent with reality and illogical,
- 8) understanding that both intellectual and emotional insight is required for belief change to be achieved,
- 9) understanding the steps necessary to achieve emotional insight (e.g. mental rehearsal of rational beliefs),
- 10) recognizing that psychotherapeutic change is a non-linear process which requires work to prevent relapse,
- 11) commitment to change.

We tailored these steps to the specific problem of exercise behavior change, seeking to persuade the user to move from a set of rigid beliefs about exercise towards a more flexible way of thinking.

The systems objective is to meet the following conversational goals.

*Goal 1: Identify an instance when exercise was not carried out*

- With the help of the system, the user identifies a time when a planned exercise was not carried out.
- The user identifies “why” exercise was not carried out. If more than one justification is given, the system invites the user to focus on one reason.

*Goal 2: Teach the basics of REBT in the context of exercise behavior*

- The system demonstrates the difference between flexible and inflexible beliefs (in the REBT therapeutic terminology “rational” and “irrational” beliefs) using some examples.
- The user is given the option to request more examples and to look at these in more detail.

*Goal 3: Argue with the user that it is their rigid beliefs which are stopping them from exercising*

- The system argues that the “reason” given above is made up of a number of rigid beliefs (demands such as “I have to feel like going jogging before I go” and intolerances such as “I can’t bear the discomfort of jogging when I don’t feel like doing so”) and helps the user identify these components.
- The system shows with an appropriate example how a flexible belief can take the place of a rigid belief.
- The system helps the user create a flexible belief to oppose each of their original rigid beliefs
- The user identifies the components of a flexible belief: a preference in place of a demand, a

bearable aspect as opposed to an intolerance, recognizing the difference between a preference and a necessity, the ability to tolerate discomfort.

- Finally, the user identifies the benefits of this new way of thinking.

Goal 4: *Ensure the user agrees that flexible beliefs are helpful to change their exercise behavior*

- The user needs to recognize that flexible beliefs are helpful and should be practiced while rigid beliefs are unhelpful and should not be practiced. This step requires the user to commit to the flexible way of thinking encouraged by REBT. Contradictions in the user's thoughts need to be highlighted until a correct understanding is reached.

Goal 5: *Negotiate a homework assignment*

- The system proposes a number of ways to practice the new-found flexible belief and gives the option of receiving reminders about this via email or SMS.

#### **4 Improving argumentation persuasiveness through the personalization of language**

When carrying out a psychotherapeutic session it is important to tailor the language used to the client, with studies evidencing that therapist–client similarity would be most advantageous for treatment outcome and client satisfaction (Lazarus 1989, Herman 1997): arguing in the language style of the client is more effective than arguing using a different tone. Following advice received from a practicing therapist, dialog was personalized along the dimensions of education level and gender. A therapist would modify the language used to the educational level of the client, using more or less complex language depending on the client's background. In the case of gender the examples might be modified appropriately (giving a fictitious character the name "Sue" for a woman or "Pete" for a man) in order for the client to have a stronger affinity with the example.

In addition, following the results of Moon (2002), which suggest that "dominant" or "submissive" language is more persuasive when used with people of a corresponding personality type (dominance or submissiveness respectively), we also personalized dialog along this dimension. We therefore tailored dialog by constructing a user model made up of:

- Gender: male/female
- Level of education: highly educated/average education
- Personality trait: dominant/submissive/neutral

User models were constructed via a series of questionnaires before users were enrolled on the wider program that the dialog system was part of. During the dialog the language generation component then used a template-based model to modify the output depending on the user model.

In the following, example 1 is a system output tailored to a female of high education, with prevailing dominant personality type, while example 2 is a system output tailored to a male of average education with prevailing submissive personality type:

1) "Here is a typical example of a person who planned to go jogging and didn't: she considered that she could not do so because she had not finished her work; here is the person's rigid and flexible belief choice:"

2) "Here is a typical example of a person who planned to go jogging and didn't: he thought that he could not do so because he had not finished his work; what the person had as a rigid and flexible belief might be like this:"

Another dimension along which dialog is personalized is continuity. This is done by the system remembering the problem discussed during the previous interaction and giving the user the choice to explore this topic again. At the same time, as noted earlier, the dialog system is aimed at people with low frustration tolerance who will possibly abandon the interaction long before reaching its conclusion. In order to address this, the system keeps track of users who have not completed the session and encourages them to engage with the REBT dialog system again the next time they enter the exercise program, reminding them of the need to make a particular effort for this task.

#### **5 Technical Design**

REBT differs from other therapeutic approaches (for example psychoanalysis and person-centered counseling) in the didactical role played by the therapist: rather than a free flow of ideas within open-ended sessions, REBT therapy follows a rigorous sequence of steps which lead from the definition of the problem to its solution (Dryden and Mytton 1999). Consequently the main design principle behind the system was that the system (as a REBT therapist) needed to retain initiative at all times, ensuring the conversational flow followed the prescribed steps without deviating from the given path or avoiding certain topics. Consequently the system only needed to cope with open ended-conversation insofar as it needed to ensure the user was not "playing" with the system: a REBT therapist would not play along with an uncooperative client as a willingness to follow the therapy and make an effort are prerequisites for this

approach; in particular REBT assumes that clients accept that they have a problem they *want* to change. The system therefore attempts to fulfill each of the goals above; but, if after repeated attempts this is not possible due to the uncooperativeness of the client, the system does not enter into an unending (and pointless) conversation: as a "real" REBT therapist, it is very direct in pointing out if a given answer is ridiculous and reminds the client that cooperation is essential and invites them to return to the dialog once they are in a more cooperative frame of mind.

Argumentation with the user proceeds by using relevant examples, encouraging the client to argue with themselves by analogy. The system checks the user's utterances to ensure that they have effectively changed to a flexible belief, looking for key phrases or words indicating flexibility of thought. This allows us to cope with typical examples of real speech, which are usually ungrammatical and may easily contain spelling mistakes.

## 6 Implementation

We implemented the REBT-based dialog system within a wider exercise behavior change program which included a number of components such as barrier identification, a planning system with calendar, email and SMS reminders, motivational tips, discussion board.

A typical interaction would be as follows:

SYSTEM: "Describe a time you planned to exercise but didn't manage to do it."

USER: "Yesterday I was going to go jogging but I just couldn't find time"

SYSTEM: "Why didn't you do this planned exercise?"

USER: "I was really busy with my project and I needed to spend more time with my wife"

SYSTEM: "Which of these had the biggest impact on your decision not to exercise?"

USER: "Being busy with my project"

SYSTEM: "In situations like this, you can either think flexibly or rigidly and it is the rigid beliefs that will usually stop you from exercising [...]"

You said that the reason you didn't exercise was: 'Being busy with my project'. [...] First identify your rigid belief..."

[...]

The conversation would then continue until the user has successfully challenged their inflexible belief and committed to practicing a more flexible way of thinking:

SYSTEM: "First identify your rigid belief...this has two components: [...] A demand (e.g. I have to feel like going jogging before I go)..."

USER: "I must have finished my project before going jogging"

SYSTEM: "An unbearable aspect (e.g. I can't bear the discomfort of jogging when I don't feel like doing so)..."

USER: "I couldn't stand leaving my project unfinished while going jogging"

If the user is unable to come up with a reasonable answer the system suggests ways in which this may be done. In the above fragment, for example, we might have had:

SYSTEM: "An unbearable aspect (e.g. I can't bear the discomfort of jogging when I don't feel like doing so)..."

USER: "I don't feel like jogging when I'm thinking of the project"

SYSTEM: "Try and reword this using words such as 'I can't stand...'"

USER: "I can't stand leaving my project unfinished to go jogging"

Once the user has identified flexible and rigid beliefs the system presents them together to the user, asking them to reflect on their truth and usefulness:

SYSTEM: "Now stand back and consider these beliefs together and answer the following questions. [...] Your rigid belief: I can't stand leaving my project unfinished to go jogging [...] Your flexible belief: I would prefer to finish my project before going jogging but I can put up with leaving my work unfinished [...] Which of these beliefs is true?"

The "correct" answer is that the flexible beliefs are both true and helpful and the system will try to steer the user towards this conclusion if they do not immediately recognize this:

USER: "The rigid belief is true"

SYSTEM: "Really!? Think of one instance when it wouldn't be true, even if very extreme [...]"

Once the user has recognized the correct answer, the system invites the user to commit to practice the flexible belief:

SYSTEM: "Ok, which of these beliefs do you want to practice in the future and strengthen?"

USER: "The flexible beliefs"

And finally suggests ways in which the belief may be practiced, for example “Rehearse your flexible beliefs several times a day...”, finally asking the user if they want to be sent an email reminder of the flexible belief, at a random time each week.

## 7 Conclusion and Further Work

We have described an automated dialog system for exercise behavior change based on Rational Emotive Behavior Therapy, showing how this well-structured therapeutic approach lends itself well to automation and how it can be applied to the specific problem of exercise behavior change. We then demonstrated how we further enhanced the system by building an element of personalization by adapting the language used in the dialog to the characteristics of the user and providing an element of continuity, an approach which has been shown to be effective in achieving good results in psychotherapy.

Further work will include an investigation into the “look and feel” of the system, including usability studies. We are also planning an evaluation of the effectiveness of the system to induce behavior change through an extended trial over a significant time span.

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