

The Use of Dialectical Dialogues in a Personalized Virtual Coach for Obese Emotional Eaters

A Research Protocol for a field study among target group

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Abstract—There is a growing number of eHealth interventions aiming at enhancing lifestyle to address obesity. However, the existing interventions do not take the emotional aspects of obesity into account. Forty percent of the overweight population is an emotional eater. Emotional eaters gain weight because of poor emotion regulation, not just due to bad eating habits. We aim at developing a personalized virtual coach ‘Denk je zèlf!’ providing support for self-regulation of emotions for young obese emotional eaters. This paper presents an eCoaching model and a research study protocol aiming at the validation of persuasive coaching strategies based on behavior change techniques. Ultimately, we aim at designing a personalized eCoaching framework, allowing us to optimally translate successful behavior change mechanisms and techniques, such as dialectical strategies, into personalized persuasive coaching strategies.

Keywords—personalized virtual coach; obesity; emotional eaters; persuasive technology; eHealth; mHealth; tailoring messages; coaching strategies.

I. INTRODUCTION

Obesity has become a major societal problem worldwide [1]. The main reason for severe overweight is excessive intake of energy, in relation to the individual needs of a human body. Obesity is associated with poor eating habits and/or a sedentary lifestyle. A significant part of the obese population (40%) overeat due to negative emotions [2]. There is little attention to the personal needs of emotional eaters when it comes to existing health interventions [3]–[5]. Current face-to-face treatments are focused on restructuring cognitions and behavior. There is a need for self-management support and personalized coaching to enhance emotional eaters in recognising and self-regulating their emotions [6][7].

II. RELATED WORK

Virtual coaching systems form a broad and vivid research area [8]–[11]. Since chatbot Eliza was invented by Joseph Weizenbaum [12], many new studies have emerged. Over the last years, virtual coaches have been developed for behavior change support, healthy lifestyle, and physical activity support [13]–[17]. Existing virtual coach applications

lack systematic evaluation of coaching strategies and usually function as (tele-)monitoring systems, limited to giving general feedback to the user on achieved goals and/or accomplished (online) assignments [18].

This paper presents an eCoaching model and the research protocol and design rationale for evaluation of persuasive coaching strategies for emotional eaters based on the Dialectical Behavior Therapy and Persuasive System Design model [19].

This research study is a continuation of the previous study on the design and evaluation of a personalized virtual coach for emotional eaters [7]. The long-term goal of the virtual coach is to raise awareness of emotional eaters on their own emotions, and to enhance a positive change of attitude towards accepting the negative emotions they experience.

In the next paragraphs in Section II, we first discuss the theoretical underpinnings of dialectical behavior therapy, persuasive coaching strategies and Ecological Momentary Assessments. Next, we elaborate on the design rationale of a personalized virtual coach. We then present the design of the research protocol in Section III. We finish this paper in Section IV with a discussion on the expected contributions of this research study, conclusion, and future work.

A. Dialectical Strategies

Dialectical Behavior Therapy (DBT) focuses on getting more control over one’s own emotions by reinforcing skills in mindfulness, emotion regulation, and stress tolerance [37]. Emotion regulation is about recognizing and acknowledging emotions and accepting the fact that they come and go. The behavior change strategies within DBT are based on validation and dialectics [20]. Dialectics changes the users’ attitude and behavior by creating incongruence between an attitude and behavior since stimuli or the given information contradict with each other. We believe that the integration of the dialectical behavior change strategies and persuasive features (PSD model) will enhance the personalization of the virtual coach for emotional eaters.

Emotional eaters deal with an invalidating daily life environment. DBT offers powerful “mechanisms of change” with a well-balanced mix of being validated in their perception of negative emotions and a confrontation

(dialectical) with a practical focus on changing problem behavior. Our eCoaching model translates these mechanisms into persuasive dialogues and persuasive features.

Validation strategies suggest responding in an empathic way, by hearing another person's point of view and accepting them (and their emotions) without judging. Dialectical strategies focus on confronting the user with a practical focus on changing problem behavior; the key is in finding a balance between acceptance of strong feelings and emotions and change by adapting feelings and emotions using emotion regulation and interpersonal effectiveness.

B. Persuasive Technology

Persuasive Technology (PT) is a significant predictor for adherence and offers strategies to reinforce the validation – and dialectical strategies' influence on attitudes and behaviors. We believe that PT can assist emotional eaters in attitude change and acceptance of their own emotions. It is essential to identify the intended outcome or change of the intervention, prior to determining the design principles and coaching strategies that would positively contribute to the persuasiveness in any way. We chose Persuasive Systems Design (PSD) model [19] for translating behavior change techniques from DBT into persuasive coaching strategies, since PSD focuses on persuasion context and easily implementable persuasive design features.

C. Ecological Momentary Assessments

Ecological Momentary Assessment (EMA) is applied to systematically collect data about daily experience and feelings of the users, as well as the context of use, for instance, through a user-friendly smartphone application. Experience sampling is widely used in daily psychiatry practice [21]-[22], nowadays allowing to real-time measure and record encountered feelings and emotions through mHealth applications.

D. Design rationale for the personalized virtual coach 'Denk je zèlf!'

The virtual coach 'Denk je zèlf!' (Dutch for 'Develop a wise mind and counsel yourself') is an interactive and self-learning persuasive system that coaches in attitude and/or long-term behavior change by providing real-time personalized support [7]. Based on the context (e.g., location), emotional state of the user, and natural language processing, the virtual coach application enables tailoring of the real-time feedback to the individual user. The coach application communicates with the user over a chat timeline and provides personal feedback based on persuasive coaching strategies, originated from validation and dialectical strategies of DBT and persuasive features of the Persuasive System Design model [19].

The open-source natural language parser, Alpino [23] is self-learning, able to recognize and understand sentences that contain emotional words or phrases. The emotion-labeled words will be divided over the basic 6 emotions [24].

The virtual coach system consists of four educational modules on intake and commitment, mindfulness, emotion regulation and stress tolerance. The user is guided to set a

personal profile, and set preferred moments for daily reminders via a text message. Users are encouraged to keep track of the moments they are experiencing cravings or giving in to a binge, and what emotions they are experiencing at those moments. The coaching system will be designed for an Android smartphone platform.

III. APPROACH AND METHODS

A. Research protocol

For the purpose of this two week field research study, we design a mockup version of the virtual coach in order to evaluate validating and dialectical strategies with the target users.

This research study aims at answering the following research questions: "Which coaching strategies do users with a specific type of emotional eating behavior benefit most from while consulting their personalized virtual coach?"; "Which coaching strategies are optimal for which emotions?" and "Which coaching approach do users prefer in which context, e.g., time of the day, before/after a craving?"

B. Target group and participants

We focus on emotional eaters (N=30), age 18-45 years, both women and men. Participants will be recruited via a Dutch franchise organization of dietitian nutritionists, who are specialized in treating emotional eating behaviors.

C. Procedures

First, a pilot study will be conducted with 2-3 participants to validate the study protocol and to test the virtual coach prototype application. Participants are ensured in the anonymity of their participation. Data collected during this research study will be analyzed for research purposes only. The data will be stored anonymously and safely on a local server, using the encrypted secure network connection (https) only the main researchers have access to.

D. Questionnaires and measures

Participants will be asked to fill out the demographics data ((nick) name, age, gender, weight, length, place of residence) and three questionnaires on eating behaviour, personality and quality of life:

- the Dutch Eating Behavior Questionnaire (DEBQ) [25]
- Five Factor Personality Inventory (FFPI) [26]
- Positive and Negative Affect Scales (PANAS) [27].

E. Ecological Momentary Assessments

During the whole time span of the research study, namely 14 days, participants will be reminded by a text message (SMS) on a daily basis to visit the mobile application and answer two questions: "Did you have cravings / have a binge today?" and "How do you feel at the moment?" The answers to these questions will allow us to find out what the optimal coaching moments might be.

F. Behavioral Chain Analysis

In the behavioral chain analysis (diary), participants will be asked to fill in what happened before they gave in to a binge, and which emotions/feelings they were experiencing.

G. Dialectical Dialogues

Participants will be presented with short dialogues (validating or dialectical) and they will be asked to select the ones they prefer, according to their (current) emotions. To trigger a certain emotion (e.g., the affect that fits best with the chosen coaching strategy), a set of pictures will be shown to the user that evoke respectively sadness, anger, fear, and disgust [28]. Then, a user will be asked to select one or more emotions they are experiencing at the moment they saw the picture(s). After that, dialogues that fit with the dominating emotion, will be presented to the user. The questions in the dialogues are labeled with one of the 4 basic negative emotions (anger, sadness, fear, disgust) and the answers are presented in accordance with one of the validating and/or dialectical (dissonant) strategies.

H. Post-interviews

Participants will be invited to participate in a semi-structured post-interview to discuss their experiences with the presented dialogues and their motivation for picking specific answers. Post-interviews will be audio recorded with permission of participants.

IV. DISCUSSION, CONCLUSION AND FUTURE WORK

This article presents the research study design to evaluate and validate the coaching strategies that emotional eaters prefer in a personalized virtual coach, based on their emotional state and context. The potential contribution of this research is divided into two fields.

First, a multidisciplinary holistic user centered design approach provides valuable insights into preferred persuasive coaching strategies of the target users for developing a meaningful and persuasive virtual coaching system for self-managing emotions. One of the main goals of the personalized virtual coach for emotional eaters is to raise awareness of their own emotions and to enhance a positive change of attitude towards accepting the negative emotions they experience daily. Ultimately, enhancing emotion regulation is expected to lead to a better weight management of emotional eaters.

Second, it will gain more insights into applying the behavior change techniques from health psychology and persuasive technology for virtual coaching application. Next step is to focus on developing virtual coaching systems that actually coach the user by analyzing real-time behavior and providing real-time personalized timely feedback based on user profile, events and context. Coaching based applications can provide self-management support for patients at times when a therapist is not available, or in the case that the user needs personalized anonymous support that is always within reach, which is the case for emotional eaters who often experience feelings of shame.

To conclude, this study makes two main contributions: (1) gaining more insights into: a) what coaching strategies emotional eaters prefer; b) what triggers emotional eaters to (over)eat and at what times of the day the craving usually occur; c) emotional states at the moments of experiencing food cravings and giving into binges, and (2) we aim at developing a general personalized eCoaching framework, enabling the optimal translation of successful behavior change techniques, such as dialectical strategies, into persuasive coaching strategies implementable for broader target groups.

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