Designing a Mobile Social and Vocational Reintegration Assistant for Burn-out Outpatient Treatment

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ABSTRACT

Using Social Agents as health-care assistants or trainers is one focus area of IVA research. This paper presents a concept of our mobile Social Agent EmmA in the role of a vocational reintegration assistant for burn-out outpatient treatment. We follow a typical participatory design approach including experts and patients in order to address requirements from both sides. Since the success of such treatments is related to a patients emotion regulation capabilities, we employ a real-time social signal interpretation together with a computational simulation of emotion regulation that influences the agent's social behavior as well as the situational selection of verbal treatment strategies. Overall, our interdisciplinary approach sketches a novel integrative concept for Social Agents as assistants for burn-out patients.

KEYWORDS

application in health, real-time integrated system

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1 INTRODUCTION AND RELATED WORK

Mental health-care systems and the treatment of patients come with high standards. Mental disorders are highly prevalent and emotionally demanding for individuals, families, and society. From affected persons, many individuals remain untreated although effective treatments exist. This so-called treatment gap differs between different mental disorders but is generally high, e.g., 56,3% (median, worldwide) for major depression [18]. For severe cases like a burn-out, where a clinical stay is required, not only the primary care lacks coverage, but also the outpatient treatment afterward.

Interactive Social Agents are, due to the incorporation of social skills (e.g., active listening, mimicry, gestures, emotion models) [3, 9, 12, 13], becoming more and more able to develop a relationship with people. Since this ability is important to tackle mental grievances [6], such agents could play a supportive role in technologically supported treatment.

For about 15 years, Social Agents are researched in the context of physical health assistants. An early system is the relational Agent Laura [3]. Laura has the role of an exercise advisor that interacts with patients for one month on a daily basis to motivate them to exercise more. Lucas et al. [20] showed which positive effects autonomous Social Agents could have in a health-care setting to overcome the barrier to receiving truthful patient information. The potential use of virtual humans as counselors in psychotherapeutic situations was investigated by Kang and Gratch [16]. Regarding the design of stress management agents, Martin et al. [22] discuss underlying requirements and challenges including the critical need to support both personalization and conversation.

2 BACKGROUND AND CONCEPTS

2.1 Burn-out and Typical Care

According to the International Classification of Diseases (ICD-11) burnout is not classified as a mental disorder. However, most burnout patients are diagnosed with a *Major Depression*, an affective disorder related to dysfunctional emotion regulation strategies [2]. In cognitive behavior therapy, such patients are admitted to a clinic (for weeks or months) [4]. Very often, patients sent home for outpatient treatment relapse [25]. The long-term success of depression treatment severely relies on a seamless outpatient treatment with a guided re-integration into work [23]. However, this is often difficult since there are long waiting lists for outpatient therapy.

2.2 Social Agents as Reintegration Assistants

As an always accessible assistant, such agents provide guidance, diary for self-monitoring, and coaching, whenever needed. With the patient's agreement, the system can provide information (e.g., specific incidents at the workplace, difficulties at home) to the patient's therapist. During the first period of cognitive-behavior therapy, patients usually have one session per week with the therapist. In between, patients could use the application to monitor their behavioral change and practice new skills. This could improve the emphasized between-session change [11] in therapy.

3 DESIGN OF EMMA

The creation of EmmA follows a participatory design approach that includes an external board monitoring Ethical, Legal, and Social Implications (*ELSI board*). The board consists of experts providing recommendations and approving design choices. Several expert

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interviews with therapists (different schools) and patients are conducted. The clinical experts opted for introducing the app already during the patient's stay in the clinic to improve patient commitment. Besides, therapists get acquainted with the application.

3.1 General Characteristics

Successful psychotherapy is related to the patient's level of self-disclosure. It is affected by aspects of the therapist, the interaction with him, the patient's appraisal of the subject he is talking about, and aspects of the patient himself [7]. For EmmA, it is essential that users self-disclose while interacting. The amount of self-disclosure of the user is dependent on the virtual agent, e.g., her trustworthiness [26] or her own self-disclosure [17]. Hence, EmmA is designed to stimulate user self-disclosure by interacting empathically.

3.2 Regulative Relational Agent Behavior

The EmmA concept is intended to support therapy. Crucial for this is that essential rules of a successful patient-therapist-relationship are applied. In this light, we favor a natural interaction via voice with the agent. Text chat is offered too (Fig. 1, chat symbol).

Nonverbal behavior is important for patient-therapist interactions [6]. EmmA's nonverbal behavior might be just as crucial. In therapy, several positive nonverbal behaviors are identified, e.g., a moderate amount of head nodding and smiling; frequent, but not staring, eye contact; active, but not extreme, facial responsiveness, and a warm, relaxed, interested vocal tone [14]. EmmA is designed to show adequate back-channeling behavior while the user is talking. Generally, the agent shows an affirmative and active aura to affect the user positively. The combination of the possibility to subtly manipulate the agent's facial expressions and the real-time social signal interpretation enables us to realize a (re-)active, but not extreme, facial responsiveness.

Mimicry describes the phenomenon that people unconsciously and automatically imitate other people in interactions and social situations. Mimicry behavior impacts the psychotherapeutic process. First, it has been proposed as a therapists' tool to improve their understanding of their patients. Mimicry is an active process to generate empathy, i.e., an understanding of the patient's feelings and perspective. Second, therapists' use of nonverbal behavior mimicry seems so have a positive effect on patients' evaluation of the therapist as well as the therapeutical relationship. Third, mimicry does not only improve the subjective assessment of the patient but also his objectively measured mental health condition [15]. EmmA's mimicry behavior serves both intrapersonal and interpersonal emotion regulation [1, 21]. Hence, EmmA does not just "copy" the nonverbal behavior of the user, since it might lead to 1) mimicry of negative emotions or 2) intensification of a user's negative self-attribution. EmmA only mimics positive social signals like smiles if there is a low chance of simulated negative internal emotions. Note, such emotions might be expressed by positive communicated emotions (e.g., smiling because of a feeling of insecurity) [9]. Hence, EmmA, e.g., would show a neutral non-verbal behavior even if the patient appears fine by communicating happiness (e.g., smile), if there is a chance that the patient is experiencing a negative internal emotion (e.g., shame).

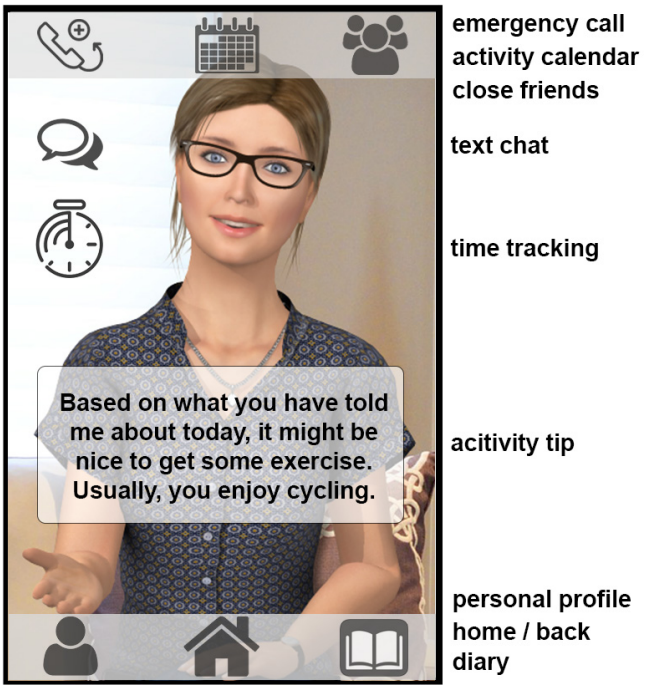

Figure 1: Application screen concept with service buttons.

3.3 Interaction Scenarios

Three interaction scenarios are considered: 1) *first acquaintance*, 2) *daily features*, and 3) *weekly features*. 1) In this phase, the user gets to know EmmA and builds trust. Following the goal-setting theory [19], personal goals and psychological resources (e.g., favorite activities) are identified together with the agent. EmmA tracks these goals, remind the user, and adapt them if needed (Fig. 1, stopwatch). Last but not least, the features are explained. 2) During the daily interaction, expressed emotions are used to refine and validate the affective user model. These include conversations about critical situations of past and future events (Fig. 1, calendar, diary). Another daily feature is the assessment of personal variables, such as drive, strain, sleep and monitoring of the well-being in the form of rating scales (Fig. 1, personal icon). 3) The weekly functions comprise of graphs for mood and working hours graph. The former is computed based on emotions and personal well-being. It allows the user to see on first glance how s/he has felt during the week. Together with EmmA, users are able to reflect on noted special occasions. This information is recorded, transcribed in a diary entry. The working hours graph compares the actual working hours with the aspired ones. This graph serves for inspection of the goal attainment. In case the goal was not achieved, EmmA offers to reflect on this, which will also be recorded in the diary.

3.4 Application Services

The three service types are considered: 1) *acquisition of the patient profile*, 2) *psychoeducation*, and 3) *stimulating action*: 1) The patient profile (Fig. 1, personal icon) is acquired both spoken and automatically. Users can provide goals for monitoring purposes (e.g., working hours, personal and life goals) and mention activities that they find positive. Users are asked twice a day how their day

went and what they did. These regular interactions will be used to assess various elements related to the success of reintegration. 2) With regard to their *psychoeducation*, many outpatients do not reflect their stress level and resources. EmmA provides a weekly mood graph. It eases the way of reflecting success and challenges during the week. In addition, users can learn about, e.g., typical behaviors during depressive episodes, possible actions against a lack of drive, possible methods to improve sleep quality or warning signs of overload. Psychoeducation improves the understanding of a disease [24] and is associated with a better resolution of the index episode and better patient global outcome [10]. 3) Based on gathered patient information, EmmA provides tips on actions that can be taken. The app will proactively guide users on doing positive activities if, e.g., a lack of drive was noticed or questions will be asked to assist users to take time and ponder about successes and challenges during the week (Fig. 1, activity tip).

4 TECHNOLOGY

The EmmA agent runs on an Android (≥ API v. 16) mobile device and consists of several interconnected components: 1) a WebGL Social Agent rendering with TTS unit, 2) a Nuance-based on-device NLU with dialog, and content management, 3) a real-time social signal interpretation framework (SSJ) [5], as well as 4) a social-emotional user model [9] and an agent behavior model [8].

5 SUMMARY AND FUTURE WORK

This paper presents a technology-driven concept for complementing the current state-of-the-art of burnout outpatient treatment.

The Social Agent EmmA is an always present burnout outpatient reintegration assistant offering relevant services identified by patients and therapist experts. The most relevant are the support of daily and weekly tasks, psychoeducation, and stimulating actions. EmmA is able to identify difficult emotional situation of the patient. If s/he agrees, the therapist can discuss these together. For communicating empathically, EmmA employs a real-time social signal interpretation together with a computational simulation of emotion regulation. EmmA's behavior is dynamically adapted to the current social-emotional situation as well as the situational selection of verbal support strategies, which are defined by experts. Both emulate important strategies of therapists. The goal is to build a relationship between patient and agent in order to activate trust and self-disclose, which are essential factors.

Next, we investigate the acceptances of this approach and if it leads to a higher success rate of reintegration for burn-out patients with fewer patients relapsing.

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