Raya: A Tangible Sports Buddy Reminding Oneself of the Commitment to Exercise

Raya: A Tangible Exercise Buddy Reminding Oneself of the Commitment to Exercise

Daphne Menheere[1(✉)], Alynne de Haan[1], Steven Vos[1,3], and Carine Lallemand[1,2]

[1] Industrial Design Department, Eindhoven University
of Technology, Eindhoven, The Netherlands
d.s.menheere@tue.nl
[2] HCI Research Group, University of Luxembourg, Esch-sur-Alzette, Luxembourg
[3] School of Sport Studies, Fontys University of Applied Sciences, Eindhoven, The Netherlands

Abstract. Although many people have a positive intention to be more active, a key challenge remains to turn this intention into action. Social support as a motivational strategy can increase adherence in exercise and can be provided by relational agents as a substitute for human coaches. We first conducted an exploratory two-week user study, to explore how emotional design and tangible interaction influences experience and motivation to exercise. We then designed a propositional research object Raya, a tangible exercise buddy that helps one to realize their workout by reminding them of their goals and self-commitment. We invite designers to bridge the gap in the design space of sport-related technologies by designing tangible artefacts embedding supportive and qualitative aesthetics of interaction rather than focusing on performance.

Keywords: Exercise motivation · Empathic virtual agent · Tangible interaction

1 Introduction and Related Work

Many people aim to incorporate exercising into their daily life. Yet a key challenge is to transform these positive intentions into exercise behavior, eventually creating a long-term exercise habit. This phenomenon is the exercise intention-behavior gap [12]. Social support as a motivational strategy can increase adherence in exercise [14], and numerous studies thus advocate for including social features in sport-related technology [13]. A way to do so is the use of relational agents also called Embodied Conversational Agents. These anthropomorphic characters are designed to build social-emotional relationships with their users, and are often used in behavior change [3]. Within this context, relational agents can take the role of coaches and are sometimes even preferred to human trainers because of the convenience and permanence of the interaction [3]. In this paper, we describe Raya, a propositional object to investigate a qualitative way to design for motivation. Raya is designed as a tangible relational agent entailing human characteristics, aiming to help overcome barriers experienced before exercise.

Over recent years, the trend in sport-related interventions is to use quantification to give exercising feedback and support people in implementing their intentions. Although

this feedback type speaks to some people, it does not necessarily reach all who would benefit from exercising regularly [7], especially those who like social support [15]. Social support as a motivational strategy to increase adherence in exercise has proven to be effective [13, 14], yet many interventions enable social support during the training session and not before. Lack of social support is also experienced prior to exercising, preventing one from initiating exercise [8, 11], resulting in an intention-behavior gap. Enabling social support outside of the training is a gap to investigate.

Embodied Conversational Agents (ECA) are used as a substitute for tasks which usually involve human interaction and are often designed to mimic the role of companions or coaches in behavior change interventions. Providing social support is an essential skill of these virtual characters, who rely on emotional design and communication strategies to achieve that aim. One of the primary goals for designers is to "*create agents capable of having natural and effective interactions with users that can produce some desirable of beneficial outcome*" [2, p. 755]. To reach this objective, extensive research on the expression of synthetic human emotions has been conducted, exploring dimensions such as speech content and tone, body language or facial expressions. Examples of relational agents supporting physical activity can be found in several studies [3, 4]. Currently ECA are majorly represented as screen-based entities having human characteristics [2]. Examples can take the form of robots, virtual pets, or other interactive devices. The effectiveness of interventions using ECA [1, 15] might result from a humanization of the user's interaction: "*Whereas computer-based interventions might be considered dehumanizing and lacking the empathy necessary for delivering intervention content, when coupled with avatars or virtual agents there are advantages that might re-humanize the user's interaction with the intervention*" [5].

2 Exploratory Study

We propose the design of a tangible relational agent that helps people realize their exercise intentions by guiding them in goal setting and self-commitment. To investigate how motivating such an agent can be, we set up an exploratory user study wizard of ozing the buddy via text messages. Findings are used to inform the buddy design.

2.1 Participants and Procedure

Five women (aged 22 to 60) participated in a two-weeks study, after obtaining informed consent. Their activity level was slightly active (exercising 1–2 per week), to moderately active (3 times a week). Five participants indicated to plan their workout upfront, and four indicated to often experience doubts to exercise. Before the study, participants filled out an initial questionnaire, including questions about their lifestyle and physical activity habits. We then asked the participants to send a text message to the (virtual) buddy when they thought of doing a workout. They thus planned their exercising goals with the buddy and explained their intention, either through a voice or text message. After planning, we invited the participants to fill out questions about their feelings telling their plans to the buddy. Before the workout, multiple messages are sent by the buddy reminding them of their planned workout and goals. Two hours after the messages, participants are asked

to fill in a questionnaire about their feelings, if the reminder came at an opportune or non-opportune moment, if they went exercising or not, and whether the messages were motivating or not. Finally, we investigated how they experienced the virtual buddy and how this affected their goal setting and motivation. Participants were also asked about the ideal look and feel of a buddy in terms of communication, relatedness, friendship and motivation.

2.2 Results

In total, the virtual buddy sent 17 reminders to the participants when they indicated having the intention to exercise that day.

Dialogue with Buddy. A first observation is an interplay between monologue and dialogue conversations between the buddy and the participant. The participants indicated, for example, being able to thank the buddy for their messages or to confirm they went for a workout. For practical reasons, a dialogue is necessary to sketch a complete overview of the planned workout. One participant mentioned that she expected to receive more messages from the buddy, and as this would be valuable in order not to forget it. Another participant felt the buddy was always there because you could talk to it at any time. One of the six participants mentioned that the spoken messages felt personal. Although the participants found it easy to communicate with the buddy over WhatsApp, it lacked a personal touch as compared to communicating in real-life. They admitted that a more personal social interaction would be more motivating than just receiving a text.

Impact on Motivation. Eleven out of 17 reminders were reported as motivating: "*It was in writing what I wanted to achieve, it helped me with extra motivation*" (P3), "*It shed light on what I found important*" (P1). The remaining six did not motivate participants, most of the time due to poor timing of the reminder. One participant indicated to prefer several messages spread out over an extended period to get support more often. Five out of six participants indicated to feel more actively involved in their exercise planning, making them more aware of what they had planned. The reminders sent by the buddy were considered positive, since it contributed to the commitment they made and to the awareness that they were on the 'right' track, making them more likely to go.

3 Design: Raya

Raya is a tangible exercise buddy designed for people who have the intention to exercise but experience doubts before doing it. Raya helps one to plan a workout and asks the user for their personal motivation to exercise that day. When the user eventually is in doubt about going or not, Raya sparks a dialogue and triggers emotions, remembering why one initially wanted to go exercising and stimulating the actual intended behavior: "*Guess what? It is almost time to [activity]! You said you wanted this because you want to [reason]. It is [date] [time] already, so go get dressed!*".

Compared to a classical voice UI system, tangible aspects are key in the interaction with Raya. The buddy's voice is medium pitched and its heart beats faster to notify the

user it wants to talk. Raya starts to speak when it detects laying on the user's hand. Raya has a silent mode by shaking it. Raya is designed as an empathic and life-like animal-shaped buddy, entailing human characteristics (heartbeat, warm touch). It intends to act as a companion capable of eliciting emotional responses. The buddy is customizable, allowing each person to adopt their preferred animal. Raya integrates multiple sensors. To detect if it is being held, we used an Hexiwear with integrated accelerometer and vibration motor to simulate a heartbeat. To enable a dialogue between the buddy and user, we used the API of Google Dialogflow (Small Talk) (Fig. 1).
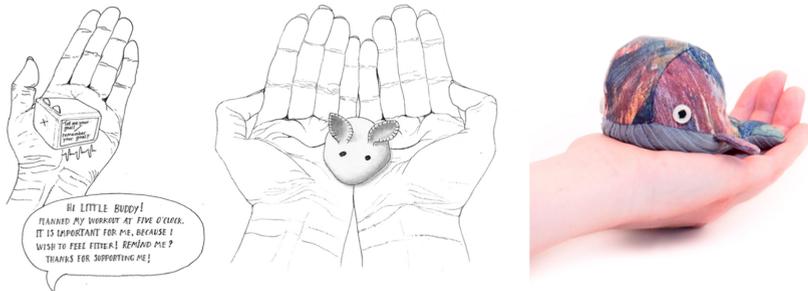

Fig. 1. Left, the heartbeat cube, which discusses with the user her plans and goals. Middle, first version of the tangible sport buddy in the shape of a mouse. Right, the final design of Raya.

4   Discussion and Conclusion

We explored the integration of tangible human attributes within a relational agent for exercise encouragement. We aimed to trigger a bond between the user and the buddy, which could support an increased motivation to exercise. Positioning this work away from quantification [6] and 'in-the-moment' interventions [9], we question current approaches of motivational design through our propositional object Raya.

Our findings showed the benefits of a supportive communication style, where a coach is perceived as an ally rather than a persuader [10]. Previous research on conversational agents highlights a concern for repetitive interactions, which reduce the engagement of the user [3] and effectiveness of the intervention. The richness of dialogue should thus be a central point of focus in the design of agents. The conversation should progress, as the buddy provides information and emotional support, also using multiple types of social support [15]. A challenge identified is to define the opportune interaction moment. When should the buddy communicate to motivate the users? When is it the 'right moment' to send a reminder or to engage in a conversation? It depends on individual preferences and contextual factors. Different implementation strategies might be adopted, from a self-report of preferences to the use of contextual data to determine the opportune timing. Further research is needed, with a larger field study and experimental variations in the buddy's attitudes to confirm these findings.

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