Using a Virtual Coach to Quit Smoking

14 Themes for User Needs

Albers, Nele; Neerincx, Mark A.; Penfornis, Kristell M.; Brinkman, Willem-Paul

Using a Virtual Coach to Quit Smoking: 14 Themes for User Needs

Nele Albers[1][0000−0002−0502−6176], Mark A. Neerincx[1,2][0000−0002−8161−5722], Kristell M. Penfornis[3][0000−0002−9758−9004], and Willem-Paul Brinkman[1][0000−0001−8485−7092]

[1] Delft University of Technology, Delft, The Netherlands
{n.albers, m.a.neerincx, w.p.brinkman}@tudelft.nl
[2] TNO, Soesterberg, The Netherlands
[3] Leiden University, Leiden, The Netherlands
k.m.penfornis@fsw.leidenuniv.nl

Keywords: Conversational agent · Virtual coach · Behavior change.

This document is an encore abstract of the paper "Users' needs for a digital smoking cessation application and how to address them: A mixed-methods study" published in the journal PeerJ [3].

1 Introduction

Designers of eHealth applications for behavior change face many options. This includes the selection of behavior change techniques [10], the implementation of these techniques (e.g., frequency), and the involvement of other parties such as a virtual coach (e.g., [13]) or healthcare professionals (e.g., [14]). Ideally, designers choose from these options such that users use and continue to use the resulting application. To this end, the application should meet user needs. However, the often reported low adherence to eHealth applications [4][6][8] suggests that current applications do not always succeed at this. A better understanding of user needs and how to address them is thus welcome.

To this end, we conducted a longitudinal study in which 671 daily smokers interacted with a virtual coach named Sam in five conversational sessions. In each session, Sam assigned users a new preparatory activity for quitting smoking, such as tracking one's smoking behavior. As becoming more physically active may facilitate quitting smoking [7][15], half of the activities addressed becoming more physically active. In the next session, Sam asked users about their experience with the activity. After the five sessions, users were invited to a post-questionnaire in which they described their barriers and motivators for doing the activities as well as their views on videos of interaction scenarios for a virtual coach (e.g., reflect on High Risk Situations (HRSs) with regards to smoking in the evenings). Based on a mixed-methods analysis that triangulated qualitative and quantitative results as well as findings from the literature, we obtained 14 main themes that describe user needs. We used these themes to formulate recommendations to help designers of eHealth applications for behavior change.

2 Analysis Strategies

Our mixed-methods analysis was based on the thematic analysis steps by Braun and Clarke [5] with the addition of triangulation with quantitative results and findings from the literature. Triangulation of multiple data sources or methods serves to increase the validity of qualitative research [11]. This resulted in these four analysis steps: 1) preparation of coding scheme, 2) manual coding of free-text responses based on the coding scheme, 3) triangulation of qualitative results with literature and quantitative results (e.g., mean ratings for intentions to engage in interactions from scenarios), and 4) search, review and definition of themes, and production of the report. All data and analysis code can be found online [2].

3 Findings

We identified 14 main themes describing user needs (Fig. 1). These themes pertain to a behavior itself (e.g., doing a preparatory activity), the user who performs a behavior, other parties that may be involved in a behavior (e.g., a virtual coach), and the environment in which a behavior is performed. Based on these themes, we formulated recommendations for designing eHealth applications for behavior change. One such recommendation is to strengthen the link between perceived usefulness and users' goals, such as by referring to users' goals and beliefs when giving advice [1] or letting users think about their desired future self with regards to a behavior [9][12].

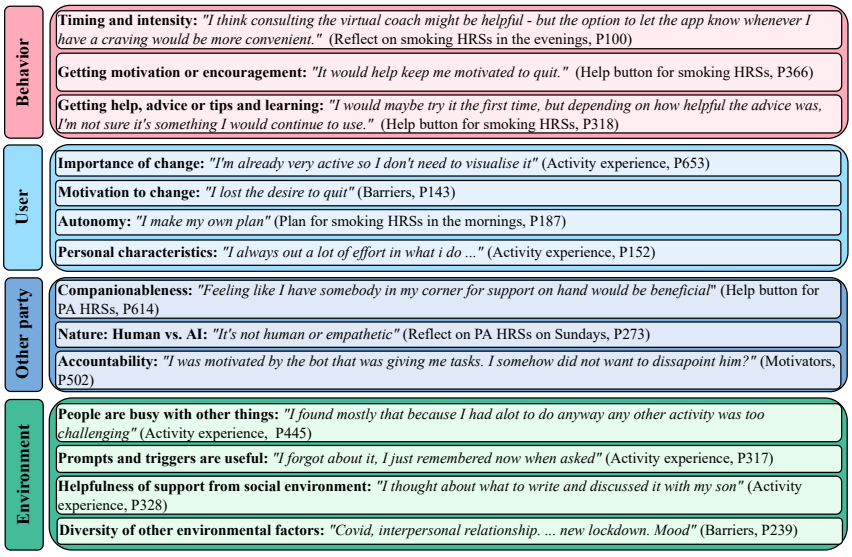

Fig. 1. 14 themes describing user needs, including quotes from participants. *Abbreviations: HRS, High risk situation; PA, Physical activity.*

Acknowledgements This work is part of Perfect Fit, which is supported by funders organized by the Netherlands Organization for Scientific Research (NWO), program Commit2Data - Big Data & Health (project num. 628.011.211).

References

1. Abdulrahman, A., Richards, D., Bilgin, A.A.: Reason explanation for encouraging behaviour change intention. In: Proceedings of the 20th International Conference on Autonomous Agents and MultiAgent Systems. pp. 68–77 (2021)
2. Albers, N., Neerincx, M.A., Penfornis, K.M., Brinkman, W.P.: Users' needs for a digital smoking cessation application and how to address them: Data and analysis code. 4TU.ResearchData (2022). https://doi.org/10.4121/20284131.v2
3. Albers, N., Neerincx, M.A., Penfornis, K.M., Brinkman, W.P.: Users' needs for a digital smoking cessation application and how to address them: A mixed-methods study. PeerJ **10**, e13824 (2022). https://doi.org/10.7717/peerj.13824
4. Beun, R.J., Brinkman, W.P., Fitrianie, S., Griffioen-Both, F., Horsch, C., Lancee, J., Spruit, S.: Improving adherence in automated e-coaching. In: International conference on persuasive technology. pp. 276–287. Springer (2016)
5. Braun, V., Clarke, V.: Using thematic analysis in psychology. Qualitative research in psychology **3**(2), 77–101 (2006)
6. Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., Hinder, S., Fahy, N., Procter, R., Shaw, S., et al.: Beyond adoption: a new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. Journal of medical Internet research **19**(11), e8775 (2017)
7. Haasova, M., Warren, F.C., Ussher, M., Janse Van Rensburg, K., Faulkner, G., Cropley, M., Byron-Daniel, J., Everson-Hock, E.S., Oh, H., Taylor, A.H.: The acute effects of physical activity on cigarette cravings: systematic review and meta-analysis with individual participant data. Addiction **108**(1), 26–37 (2013)
8. Kelders, S.M., Van Zyl, L.E., Ludden, G.D.: The concept and components of engagement in different domains applied to ehealth: a systematic scoping review. Frontiers in psychology **11**, 926 (2020)
9. Meijer, E., Gebhardt, W.A., van Laar, C., van den Putte, B., Evers, A.W.: Strengthening quitter self-identity: An experimental study. Psychology & health **33**(10), 1229–1250 (2018)
10. Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M.P., Cane, J., Wood, C.E.: The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Annals of behavioral medicine **46**(1), 81–95 (2013)
11. Nancy Carter, R., Bryant-Lukosius, D., Alba DiCenso, R.: The use of triangulation in qualitative research. In: Oncology nursing forum. vol. 41, pp. 545–7. Oncology Nursing Society (2014)
12. Penfornis, K., Gebhardt, W., Meijer, E.: Mijn toekomstige zelf is (niet) gestopt met roken: Een experimentele studie naar de effecten van een toekomstige-zelf interventie op de zelfidentiteit van rokers. Nederlands Netwerk voor Tabaksonderzoek (NNvT) Congres (2021)
13. Perski, O., Crane, D., Beard, E., Brown, J.: Does the addition of a supportive chatbot promote user engagement with a smoking cessation app? an experimental study. Digital health **5**, 1–13 (2019). https://doi.org/10.1177/2055207619880676

14. Siemer, L., Brusse-Keizer, M.G., Postel, M.G., Allouch, S.B., Bougioukas, A.P., Sanderman, R., Pieterse, M.E., et al.: Blended smoking cessation treatment: exploring measurement, levels, and predictors of adherence. Journal of medical internet research **20**(8), e9969 (2018)
15. Trimbos Instituut: Richtlijn behandeling van tabaksverslaving en stoppen met roken ondersteuning: Herziening 2016 (2016)