

Building an Intelligent System to Reduce Impulsive Snacking by Providing Tailored and Contextualized Feedback

Applicants

Eligible proposals must have two (and only two) applicants from different disciplines within the Network Institute.

Supervisor Name	Department/Group	Faculty
1. Michel Klein (MK)	Computer Science / AI	FEW
2. Guido van Koningsbruggen (GK)	Communication Science	FSW

Project description

Provide a brief description of the project (max. 300 words)

To control the “obesity epidemic”, health messages promote intentions to reduce unhealthy snacking. While general messages often fail to influence intentions, tailoring messages to the needs of individuals can increase healthy intentions¹. Unfortunately, our “toxic environment” full of calorically-dense foods confronts people with temptations, making them forget their healthy intentions. Consequently, people often act on impulse and make unhealthy snack choices.

Subtle health message-strategies exist that decrease impulses and reduce unhealthy snack choices by reminding people of their healthy intentions (e.g., messages priming health goals)^{2,3}. What remains lacking, however, is a mechanism to deliver the right message at the right time (e.g., when buying lunch). This project therefore investigates whether an intelligent system can reduce unhealthy snacking by providing nudges/notifications via a mobile phone app tailored towards the person’s needs, time of the day and his/ her physical environment (location).

For that reason, we will first develop a questionnaire both measuring unhealthy snacking determinants and where/when people experience difficulties in resisting unhealthy snacks. This will be investigated among VU-employees to identify locations at the VU-campus that are associated with unhealthy snacking (e.g., Spar/cafeteria/vending machines). Furthermore, results will be used to define different messages targeting the most important determinants of unhealthy snacking.

Second, a mobile app will be developed based on an existing sensing framework that keeps track of the (GPS-)location and time of the day. Furthermore, we will develop a computational model to relate characteristics of specific situations (location/time) with a user’s individual determinants of unhealthy snacking. This will be used to generate and present personalized/tailored, contextualized and timed health messages. An intervention study will test the effectiveness of the app in reducing unhealthy snacking. Additionally, we will investigate the possibilities to automatically learn which moments in the day and physical locations lead to unhealthy choices for a specific person.

Length: 300 words

Project Organization

Each proposal requests two Academy Assistants from different disciplines. Describe their roles and describe the skills and expertise required from them. (max. 300 words)

In the first part of the project, a questionnaire will be developed to measure both unhealthy snacking determinants and where/when VU-employees experience difficulties in resisting unhealthy

snacks. Based on the results different health messages will be defined targeting specific determinants of unhealthy snacking. This task requires one assistant with a strong background in health and risk communication. In addition, this assistant needs skills and expertise related to quantitative research in order to design and analyse the survey and intervention study. The results of the questionnaire (information about determinants/locations) also inform the development of a computational model to enable the delivery of the right health message at the right time. This model will form the core of the mobile app that will be developed based on an existing sensing framework. The development of the app and computerized model requires an assistant with a background in computer science (programming skills) and artificial intelligence (modelling). This assistant also needs to have some experience with experimental research.

Both Academy Assistants will further work in collaboration by conducting an intervention study to test the effectiveness of the app in reducing unhealthy snacking. In this part of the project, the assistant with a background in health communication will pay specific attention to evaluating the effectiveness of the different health messages, which requires skills and expertise on experimental research. The assistant with a background in artificial intelligence, on the other hand, will apply machine-learning techniques to investigate whether risky situations can be automatically determined. Besides topic-specific knowledge and skills/expertise on the methods required for this research, both assistants need excellent management and communication skills and an open mind towards interdisciplinary research. We also believe that it is important that both assistants are enthusiastic about communicating the project results to both academic and non-academic audiences.

Length: 297 words

Collaboration

Describe how your research improves collaboration and cross-pollination between the disciplines involved (max. 300 words)

This research proposal strengthens links between scholars from Communication Science and Computer Science, providing benefits for the proposed research as well as a nucleus of collaboration to build on in the future. While communication scholars know a lot about what kind of health messages works best in promoting healthy intentions and behaviour, they experience problems in delivering the right message at the right time. Here communication scholars need the expertise of computer scientists on computational modelling to relate information regarding situational circumstances and personal characteristics to relevant health messages. This enables communication scholars to increase the effectiveness of health messages in promoting healthy behaviour. The computer science discipline, on the other hand, benefits from this collaboration because it contributes knowledge about health communication to the existing work on personal (health) support systems. Within the AI department is quite some experience with developing computer systems that are able to understand the context and situation of a user and adapt their behaviour accordingly. However, how to design messages that can improve healthy intentions and behaviour is not known within Computer Science. This knowledge will enable computer scientists to build systems that are more effective in supporting people. Furthermore, being able to deliver the right health message at the right time using new technologies is of high societal relevance; based on the results, the effectiveness of health interventions can be improved. This project thus further strengthens the societal relevance of both disciplines and will foster awareness of new opportunities for valorisation of research results.

Length: 251 words

Deliverables

Enumerate intended project results: papers, research proposals or otherwise. (max 200 words)

All project members will be involved in writing an article about the outcomes of the project. The article will be submitted to a journal relevant for both disciplines (e.g., Computers in Human Behavior). If possible, results of the project will also be presented at national conferences (e.g., Etnaal van de Communicatiewetenschap) in order to offer the assistants experience in presenting findings for a

scientific public. We would also like our assistants to gain experience in disseminating their findings to non-academic audiences, for instance, by presenting the results for practitioners involved in the development of health campaigns (e.g., health professionals from the Dutch Nutrition Centre [Voedingscentrum] who are in the network of GK). If time permits, we will stimulate the assistants to write a guest blog for Sciencepalooza.nl and SocializingScienceVU.com to further disseminate the project results to non-academic audiences. Moreover, during this project we will define a roadmap for future research, which should culminate in a funding application (e.g., Horizon 2020; NWO creative industries program). To summarize, deliverables include a scientific journal article; conference presentations; dissemination of results to non-scientific audiences; funding application.

Length: 182 words

Planning

Provide a breakdown of the project into phases with tentative timing (max 150 words)

Task(s)	Person(s)	Month(s)
Recruiting Academy Assistants	MK/GK	August-September
Developing, conducting, analyzing survey to investigate where/when tempting situations and determinants of unhealthy snacking	AA1 (with input from AA2)	October-December
Developing app, questions to determine personal health goals and computerized model	AA2 (with input from AA1)	October-January
Define health messages	AA1	January
Conducting and analyzing intervention study	AA1/AA2/MK/GK	February-May
<ul style="list-style-type: none"> Effectiveness and feasibility intervention 	AA1/AA2/MK/GK	
<ul style="list-style-type: none"> Evaluate health messages 	AA1/GK	
<ul style="list-style-type: none"> Apply machine learning techniques to investigate whether risky situations can be automatically determined 	AA2/MK	
Write up results	AA1/AA2/MK/GK	May-July
Disseminating (preliminary) results*	AA1/AA2	May-July
Roadmap future research, funding application	MK/GK	February-July

AA1 = Academy Assistant 1 (communication science background); AA2 = Academy Assistant 2 (computer science background); MK = Michel Klein; GK = Guido van Koningsbruggen;

* we anticipate submitting the paper at the project's end-date.

Length: 135 words

References

- Klein, M., Mogles, N., Van Wissen, A. (2014). Intelligent mobile support for therapy adherence and behavior change. *Journal of Biomedical Informatics*, 51, 137-151.
- Papies, E.K., Potjes, I., Keesman, M., Schwinghammer, S., & Van Koningsbruggen, G.M. (2014). Using health primes to reduce unhealthy snack purchases among overweight consumers in a grocery store. *International Journal of Obesity*, 38, 597-602.
- Van Koningsbruggen, G.M., Veling, H., Stroebe, W., & Aarts, H. (2014). Comparing two psychological interventions in reducing impulsive processes of eating behaviour: Effects on self-selected portion size. *British Journal of Health Psychology*, 19, 767-782.