

# Individual Differences in Persuadability in the Health Promotion Domain

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**Abstract.** This paper examines the behavioral consequences of individual differences in persuadability in the health promotion domain. We use a 7-item persuadability instrument to determine participants persuadability score. Based on this score two groups are created: the low and high persuadables. Subsequently, we present 2 studies that test the responses to health-related persuasive messages of both low and high persuadables. The results consistently show that high persuadables comply more to messages with a persuasive content as compared to a neutral message than low persuadables. Even more, both studies indicate lower compliance by low persuadables when persuasive messages are employed. Implications of this possible detrimental effect of the use of persuasive messages for low persuadables are discussed.

## 1 Introduction

Modern societal trends and technological developments enable many people to go about their daily life with only minor physical effort and easy access to an excessive amount of food. While this creates a comfortable environment, there is also a downside. The adoption of a sedentary lifestyle combined with unhealthy eating habits, has been identified as one of the main causes of physical and mental health problems (e.g. [28]).

As a reaction to these health problems, public awareness of the importance of a healthy lifestyle has increased considerably over the last decades. The field of health promotion is quickly expanding both in terms of research efforts as well as (commercially) available health solutions. Starting with straightforward public campaigns from governments and health professionals, the field of health promotion nowadays employs a multidisciplinary approach integrating insights and methods from multiple domains to optimize the effectiveness of interventions. Within this multidisciplinary context, there is a key role for persuasive technologies — *technologies intentionally designed to change a person's attitudes or behaviors* [9] — to change health-related attitudes, beliefs, and behaviors.

In this article we examine how people's persuadability — their tendency to comply to implementations of persuasive strategies — influences their compliance to a series of health and lifestyle related persuasive requests.

## 1.1 Persuasive technologies for a healthier lifestyle

Research in persuasive technology has typically focused on bringing about socially desirable changes in attitudes and behaviors [21], including health related behaviors. Applications have been designed which influence people to smoke less [26], assist people in losing weight [22], or help people maintain a healthy workout regime [20]. Not surprisingly, the use of persuasive technologies for human wellbeing has been a focus of many researchers and practitioners [12].

One of the main benefits of employing persuasive technologies for health intervention programs is that content and persuasive delivery style (i.e., the type of persuasion strategy that is employed to deliver the message) can be personalized for different users. Inspired by insights from several behavior change theories, personalizing program content has become a central theme in health intervention programs (E.g. [18, 24, 14]). These programs increasingly use a personalized approach that considers specific user characteristics such as readiness to change behavior and current behavior to adapt the program content.

However, this personalization is often limited to adapting content to a limited set of user characteristics strongly related to the behavior under consideration. Less attention has been paid to the personalization of persuasive delivery style of program content or specific health requests. We believe that, in order to develop effective programs that are powerful in persuading *individuals* to change their health-related attitudes and behaviors, a better understanding is needed of how different individuals respond to the persuasive strategies employed in communication.

Health related persuasive technologies already exist in commercial form. Product-service combinations like DirectLife, MiLife and FitBug (e.g. [11, 19]) make an attempt at influencing people to adopt a healthier lifestyle, through the implementation of strategies and theories from motivation and persuasion research. All these products make life easier by automatically monitoring the user's behavior through wearable accelerometers. Websites allow for the presentation of activity levels and patterns to make people aware of their behavior. Through the usage of strategies like goal setting, tailored encouraging feedback, and social facilitation the product-services support users to make positive changes in their physical activity behavior and nutritional intake [20].

Although there is an increase in numbers of these commercially available products there is little to no information about which persuasive strategy is most effective for which person and why. In other words, we do not know *what-works-for-whom*. This is surprising given the general belief that human persuasive agents (e.g. sales representatives or spokesmen) successfully adopt their content and framing to their audience.

## 1.2 Persuasive strategies

A large number of persuasive strategies exist. Theorists have varied in how they categorize strategies: Fogg [10] describes 40 strategies under a more general definition of persuasion while Rhoads lists over a 100 [27]. Kaptein et al. [17] describe

over 35 strategies making a clear distinction between source and message characteristics and the users position on the attitude behavior continuum [1].

In this article we adopt Cialdini's [7] 6 strategies. Cialdini [7] distinguishes *reciprocity* – people feel obligated to return a favor [13], *scarcity* – when something is scarce, people will value it more [30], *authority* – when a request or statement is made by a legitimate authority, people are more inclined to comply [23], *commitment and consistency* – people do as they said they would [6, 8], *consensus* people do as other people do [7, 2], and *liking* people say “yes” to people we like [6]. We focus on Cialdini's principles as these are simple and parsimonious.

### 1.3 Persuadability

The effectiveness of influence strategies varies from one person to another. Kaptein et al. [15] show a relation between users susceptibility to different persuasive strategies and their compliance to requests supported by implementations of these strategies. One appealing explanation for such a relation is found in the work on dual-processing models. Dual-processing models of persuasion distinguish two main “routes” by which advocacy is processed [4]. Central (or systematic) processing, is characterized by elaboration on and consideration of the merits of presented arguments, and peripheral (or heuristic) processing is characterized by responses to cues, which are associated with but peripheral to the contents of the central arguments. [5, 25].

Cacioppo [3] introduced the construct *need for cognition* – defined as people's tendency to think and scrutinize arguments. Need for cognition is strongly associated with the type of processing route. An increase in need for cognition makes central processing of messages more likely [4, 29]. Hence, people in low need for cognition are more persuadable by influence strategies than people high in need for cognition.

Recently, Kaptein and Eckles [16] found in their study amongst 179 participants that general compliance to implementations of Cialdini's [6] strategies is more accurately assessed using a number of simple questionnaire items that directly address susceptibility to the 6 strategies than the more general need for cognition scale as proposed by Cacioppo [3]. In this paper we assess people's overall persuadability — their tendency to comply to messages supported by persuasive arguments — using items derived from the study by Kaptein and Eckles [16].

### 1.4 Overview

Our research aims at gaining a better understanding of the effects of persuasive health-related messages on individuals with different degrees of persuadability — differences in tendency to comply to persuasive strategies. We describe two experiments in which low persuadables and high persuadables are compared in their responses to health-related messages that are either persuasive — employing a number of Cialdini's persuasion strategies — or neutral.

Based on the existing literature in this area and recent earlier work on individual differences in persuadability, we expect to find the following:

- *H1*: Overall, the use of persuasive strategies will lead to higher compliance.  
*However:*
- *H2*: High persuadables will comply *more* to a persuasive health-related message than to a neutral health-related message
- *H3*: Low persuadables will *comply equally* to a persuasive health-related message as to a neutral health-related message

## 2 Persuasion profiling studies

### 2.1 Measuring persuadability

In our experiments we distinguish high and low persuadables. Therefore, we set out to identify both low and high persuadables. 1933 Knowledge workers located in one single office park were invited by email to participate in a 7-item questionnaire to assess their overall persuadability. 516 Participants completed the online questionnaire.

The following 7-item persuadability scale was used to assess a participant's persuadability score. The items were scored on a 7-point scale ranging from totally disagree to totally agree. These items previously proved most distinctive in estimating the overall effect of the use of persuasive strategies for individuals.

- Products that are “hard to get” represent a special value
- I would feel good if I was the last person to be able to buy something.
- I believe rare products (scarce) are more valuable than mass products.
- I always follow advice from my general practitioner
- I am very inclined to listen to authority figures
- I always obey directions from my superiors
- I am more inclined to listen to an authority figure than to a peer

The scale reliability proved rather low ( $\alpha = 0.646$ ). This is consistent with previous findings [15] and can be explained by the multidimensionality of the scale: it addresses persuadability by the expert strategy as well as the scarcity strategy. However, for our current experiments we focus merely on overall persuadability and not on specific persuadability by specific strategies.

For each participant we computed an overall persuadability score: the average of the 7 susceptibility to persuasion items. Based on the persuadability scores, we defined three persuasion profiles: the low persuadables, the moderate persuadables, and the high persuadables. Since we aimed for groups with a considerable difference in persuadability score, we selected only the participants with the low and high persuasion profiles for further participation in our studies. The *low persuadables* ( $N = 136$ ) — the lowest scoring quartile — had scores ranging from 1.00 to 3.29. The *high persuadables* ( $N = 140$ ) — the highest scoring quartile — had scores ranging from 4.57 to 6.14. By selecting the two extremes of

the scale for participation in our experiment we feel that even though the scale reliability of the persuadability score was rather low, the two selected groups differed sufficiently to compare the effects of persuasive messages on both high and low persuadables.

## 2.2 Differences in responses to persuasive messages.

In two studies we examined the practical applicability of the persuasion profiles for promoting health-related behaviors in a real world setting. Study 1 focused on physical activity and study 2 focused on fruit intake. Below, we present the common methodology used in both studies. This is followed by a separate presentation of the detailed procedures and results.

**Common methodology** In both studies the low and the high persuadables (total  $N = 276$ ) were invited by email to participate in a health related activity. Study 1 focused on physical activity by inviting participants by e-mail to join a lunchwalk. Study 2 focused on fruit intake by inviting participants by e-mail to express their opinion about an initiative to provide a daily fruit snack. In both studies half of the participants were randomly assigned to the *persuasive implementation(s)*, (*PI*) condition and half of the participants were assigned to the *no persuasive implementation(s)*, (*NPI*) condition. In the PI condition, the invitation e-mail was supported by a number of persuasive messages while in the NPI condition no persuasive messages were included. The studies thus employed a 2 (PI vs NPI) by 2 (High persuadable vs Low persuadable) between subjects design.

After receiving the invitation email participants were asked to sign up using an online form. To gain a detailed insight into the degree of compliance to the invitations, we distinguished three measures of compliance:

- *Interest*: Participants click on the email.
- *Intention*: Participants response to the main question in the online form (e.g. the sign up for a lunchwalk).
- *Behavior*: Participants subsequent behavior.

**Procedure Study 1: Lunchwalks** In study 1 participants were invited to join a lunchwalk. Participants received an email with an invite and a link to sign up for one of two possible time slots during lunch. After clicking on the link participants could sign up for one of the two time slots. After signing up participants were asked to print a form with their name on it and bring it to the lunchwalk enabling us to monitor the actual behavioral response.

Participants in the NPI condition received an email stating: " *We would like to invite you for the [Company] lunch walk. The [Company] fun4health committee was founded 2 months ago to promote general health of [Company] employees and affiliates.* ", the time of the lunchwalk and the link to sign up. Participants in the PI condition received the same email with an addition of the following three messages:

- 1. Both physicians and general practitioners recommend at least 30 minutes of moderate activity, such as walking, during a day. The lunch walks are a great place to start! [Authority]
- 2. We expect a lot of people so please sign up before all available slots are filled. [Scarcity]
- 3. In other companies 1000s of people are already joining in on similar initiatives. [Consensus]

Implementations of the scarcity and the expertise strategies were chosen because of their direct relation to the 7-item persuadability scale. In order to maximize the effect of persuasive arguments, we added the consensus strategy because of its known strong effects (e.g [7, 2]).

We chose to conduct study 1 at two points in time — referred to as *study 1a* and *study 1b* — on the same groups of high persuadables and low persuadables, because we expected that unpredictable weather conditions could be experienced as a barrier for behavioral compliance for the outdoor activity. Each of our participants worked in the same industrial area with a common dining facility which was the starting point for the lunchwalks.

**Results study 1** In total, 276 respondents were invited to participate in study 1a. Of these 136 belonged to the low persuadable group, and 140 belonged to the high persuadable group. About half of the participants received an email without the persuasive cues and about half received an email with persuasive cues. Table 1 gives an overview of the results of the study 1a. It is clear that *H1* is supported for both interest and intention: In the PI condition participants overall showed significantly more *interest* (PI = 23.4%, NPI = 15.6%,  $\chi^2 = 2.700$ ,  $p = 0.050$ ), and have a significantly higher behavioral *intention* (PI = 8.5%, NPI = 3.0%,  $\chi^2 = 3.887$ ,  $p = 0.024$ ). No significant effect was found on actual *behavior*.

		NPI	PI	$\chi^2$	$p$ (one-sided)
<i>H1: Main effect</i>					
	Interest	15.6%	23.4%	2.700	0.050
	Intention	3.0%	8.5%	3.887	0.024
	Behavior	1.5%	3.5%	1.189	0.138
<i>H2: Interaction</i>					
Low persuadables	Interest	17.2%	16.7%	0.007	0.468
	Intention	3.1%	6.9%	1.012	0.157
	Behavior	.	1.4%	0.895	0.172
High persuadables	Interest	14.1%	30.4%	5.426	0.010
	Intention	2.8%	10.1%	3.124	0.039
	Behavior	2.8%	5.8%	0.758	0.174

**Table 1.** Results study 1a: Percentage of respondents responding favorably.

The observed main effect can be explained by the high compliance of the high persuadables (e.g. *interest*: PI = 30.4%, NPI = 14.1%,  $\chi^2 = 5.426$ ,  $p = 0.010$ ).

For low persuadables no main effect of the persuasive message is observed (e.g. *interest*: PI = 16.7%, NPI = 17.2%,  $\chi^2 = 0.007$ ,  $p = 0.468$ ). Thus, while overall the use of persuasive messages increased the participation in health related behavior the actual cause of this effect is a very high compliance by high persuadables while there is no statistically significant difference between the NPI and the PI conditions for the low persuadables – supporting *H2* and *H3*.

In study 1b, the invitation was send out to 268 people – a number of people signed out for any follow up mails after the invite for study 1a and were not invited again. Table 2 shows the results of this second trial. *H1* was again confirmed for the *interest* measure (PI = 10.9%, NPI = 4.6%,  $\chi^2 = 3.761$ ,  $p = 0.026$ ). As in study 1a, this main effect of persuasive implementation disappeared when looking only at low persuadables (e.g. *interest* PI = 5.4%, NPI = 8.8%,  $\chi^2 = 0.570$ ,  $p = 0.251$ ). In this second trial we also find that for the *intention* measure the low persuadables complied significantly less when persuasive implementations were used in the invitation message (PI = 0.0%, NPI = 7.0%,  $\chi^2 = 5.357$ ,  $p = 0.017$ ).

		NPI	PI	$\chi^2$	$p$ (one-sided)
<i>H1: Main effect</i>					
	Interest	4.6%	10.9%	3.761	0.026
	Intention	3.1%	2.2%	0.196	0.329
	Behavior	0.8%	1.5%	0.293	0.294
<i>H2: Interaction</i>					
Low persuadables	Interest	8.8%	5.4%	0.570	0.251
	Intention	7.0%	.	5.357	0.017
	Behavior	1.8	.	1.308	0.127
High persuadables	Interest	1.4%	17.5%	11.049	0.001
	Intention	.	4.8%	3.603	0.029
	Behavior	.	3.2%	2.384	0.062

**Table 2.** Results study 1b: Percentage of respondents responding favorably.

**Procedure study 2** Study 2 was relatively similar to study 1: Again we invited both high and low persuadables to take part in a health related activity. This time an email was sent to 267 participants in which we explained that plans were being made to start a fruit distribution service at the main building of the office campus. It was explained that participants would be able to pick up a piece of fruit every day. The alleged goal of the email was to inquire about possible interest for such a project. Participants could click on a link in the email to state their interest in such a service. Finally, participants were told that in return for their effort of filling out the information they could pick up a free piece of fruit during lunch two weeks after the email was send out.

In the *PI* condition the following lines were added to the email: “*Eating two pieces of fruit a day is recommended by the World Health organization. our*

service would make it easier to reach that target” [Authority]. And: “Other companies have picked up similar ideas by providing fruit during lunchtime for reduced prices for employees. If we all join in, we could make this service happen!” [Consensus].<sup>3</sup>

Similar to study 1, we measured three types of compliance: *interest* (did the participant click on the email link), *intention* (did the participant respond to the subsequent survey), and *behavior* (did the participant pick up a free piece of fruit).

**Results study 2** Only 2 persons picked up their free piece of fruit 2 weeks later. Therefore we focus our analysis on the remaining two compliance types: *interest* and *intention*. Table 3 shows that the results slightly differ from those obtained in study 1: There is no significant main effect of the persuasive implementations, disproving *H1* (e.g. *interest* PI = 23.4%, NPI = 21.8%,  $\chi^2 = 0.149$ ,  $p = 0.350$ ).

When looking at the low persuadables and the high persuadables separately it is clear that the absence of a main effect is probably best explained by an interaction effect: Low persuadables seem to comply less to a message with persuasive implementations (e.g. *interest* PI = 18.8%, NPI = 25.8%,  $\chi^2 = 0.919$ ,  $p = 0.196$ ) while high persuadables seem to comply more (e.g. *interest* PI = 27.8%, NPI = 17.2%,  $\chi^2 = 2.159$ ,  $p = 0.071$ ). Both of these are however not statistically significant at a five percent level in study 2.

		NPI	PI	$\chi^2$	$p$ (one-sided)
<i>H1: Main effect</i>					
	Interest	21.4%	23.4%	0.149	0.350
	Intention	15.9%	15.6%	0.004	0.476
<i>H2: Interaction</i>					
Low persuadables	Interest	25.8%	18.8%	0.919	0.196
	Intention	21.0%	13.0	1.468	0.082
High persuadables	Interest	17.2%	27.8%	2.159	0.071
	Intention	10.9%	18.1%	1.369	0.089

**Table 3.** Results study 2: Percentage of respondents responding favorably.

### 2.3 Discussion

The results presented in this paper suggest that individuals differ in their compliance to health-related messages. When analyzing these differences between high persuadable people and low persuadable people it is evident that a positive effect of persuasive message is obtained *only* for high persuadables and is absent or even *negative* for low persuadables. This consistent result implies that, even

<sup>3</sup> Contrary to study 1, no implementation of scarcity was used in the persuasive implementation condition in study 2

though the main effect of using persuasive messages is generally positive, care needs to be given to the use of persuasive messages for specific individuals.

Below, we discuss the obtained results using a dual-processing perspective and briefly address the implications of our results for the health promotion domain.

From a dual-processing perspective, one could argue that the different types of compliance employed in our studies (i.e., *interest*, *intention*, and *behavior*) differ in the amount of requested effort which may have impacted the employed type of processing route. While *interest* and *intention* require the mere formation of a plan, actual *behavior* requires a physical investment; entailing 30 minutes and 5 minutes of physical effort in study 1 and study 2, respectively.

It may very well be the case that when a request entails relatively little effort, contents of a message are elaborated on less thoroughly, leading to peripheral processing for those that are susceptible to this (the high persuadables). This may explain the significant positive effect of persuasive messages for the high persuadables for the interest and intention measures and the absence of such a positive effect (or even a negative effect) for the low persuadables in Study 1 and Study 2.

The actual translation of plans into behavior requires more effort and may therefore lead to more thorough processing which is typically done centrally. In the case of central processing, people are less susceptible to persuasive arguments and are more likely to thoroughly elaborate on the pros and cons of engaging in the behavior. People probably considered the effort not outweighing the reward in our studies 1 and 2, leading to general low behavioral compliance independent of peoples persuasion profile. Alternatively, different types of persuasive messages could be more effective to increase behavioral compliance.

The *anticipation*, rather than the actual efforts and rewards of compliance, may have had an impact on the type of processing. This anticipation might have affected *intention* and *interest* compliance (despite the fact that these are actually low effort). The studies differed in the amount of requested effort and anticipated reward, i.e., the lunch walk: 30 minutes of physical effort versus fruit snack: 5 minutes of effort and a tangible reward. The low effort anticipation may have made peripheral processing more likely in study 2 than in study 1, explaining the larger difference between the responses of high and low persuadables.

The possible complicated effect of anticipated and actual efforts and rewards on processing route and the interaction between people's persuasion profile and the employed persuasive messages should be taken into account when tailoring the content and delivery style of persuasive systems to optimally influence both intentions and behaviors. Moreover, we consider the limited behavioral compliance obtained in our studies as worrisome for the field of health related persuasive technologies where eventually we strive for behavioral compliance. Therefore, we believe that studies into persuasive technology and persuasive messaging should expand their focus from attitude/belief change to the challenging goal of behavior change.

### 3 Conclusions

We find that in general influence strategies can often be used to increase compliance to health related messages. This replicates the mainstream finding in compliance gaining research. Our main contribution lies in the following two findings: 1) We show that compliance to health related messages is moderated by persuasion profiles. In particular, persons identified as high persuadables are more susceptible to health related messages with a more persuasive tone, than are persons identified as low persuadables. Even more, we demonstrate for the latter group that in the best case the persuasive health related messages encourage the same level of compliance as neutral messages; in the worse case it is considerably lower. 2) We show an utter lack of behavioral compliance. A finding that is particularly troublesome as the studies required no long-term commitments to health behavior change, merely a one-time simple relatively low to moderate physical investment.

Although current research that aims at improvements in health related behavior (e.g. a higher exercise level) on a population level is valuable to encourage health behavior change, we believe that interventions tailored to persuasion profiles could be more effective. In particular, through the identification of persons that might respond adversely to persuasive interventions, higher intervention compliance could be achieved by the adaptation of persuasion strategies. Considering people’s tendency for central processing (leading to lowered susceptibility to persuasive messages) when anticipated efforts exceed a certain threshold and when the anticipated reward is small, the difficult task of achieving behavioral compliance might be accomplished when persuasive messages are combined with intervention strategies aimed at decreasing perceived effort and increasing anticipated rewards.

#### 3.1 Future work

Our planned next steps follow directly from our concluding remarks. First, we would like to extend the current “black-or-white” persuasion profiles to profiles based on users’ susceptibility to specific influence strategies. We hope that a more detailed approach — combined with more detailed analysis of our data using multi level models to model individual responses to influence strategies — can increase our success in identifying groups of users that might respond differently to persuasive strategies. We feel this is of importance given the aim of designing systems that are beneficial to *every* user.

Second, we would like to extend the actual behavioral impact of our work. Our work emphasizes the need for behavioral measures of influence strategy effectiveness in the health and lifestyle domain. Although an increase of interest and intention for healthy behaviors by users is valuable, the adoption of actual healthier behaviors is crucial. In the future we will study the effects of influence strategies on behavior in a longitudinal fashion which will hopefully enable us to collect more behavioral data.

## Bibliography

- [1] Aarts, E.H.L., Markopoulos, P., Ruyter, B.E.R.: The persuasiveness of ambient intelligence. In: Petkovic, M., Jonker, W. (eds.) *Security, Privacy and Trust in Modern Data Management*. Springer (2007)
- [2] Ajzen, I., Fishbein, M.: *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall (1980)
- [3] Cacioppo, J.T., Petty, R.E.: The need for cognition. *Journal of Personality and Social Psychology*. (1982)
- [4] Cacioppo, J.T., Petty, R.E., Kao, C.F., Rodriguez, R.: Central and peripheral routes to persuasion: An individual difference perspective. *Journal of Personality and Social Psychology* 51(5), 1032-1043 (1986)
- [5] Chaiken, S., Chen, S.: The Heuristic-Systematic model in its broader context. In: Chaiken, S., Trope, Y. (eds.) *Dual-process Theories in Social Psychology*, pp. 73–96. Guilford Press (1999)
- [6] Cialdini, R.: *Influence, Science and Practice*. Allyn & Bacon, Boston (2001)
- [7] Cialdini, R.: The science of persuasion. *Scientific American Mind* 284, 76–84 (2004)
- [8] Deutsch, M., Gerard, H.B.: A study of normative and informational social influences upon individual judgment. *Journal of Abnormal and Social Psychology* 51, 629–636 (1955)
- [9] Fogg, B.J.: Persuasive technologies: Introduction. *Communications of the ACM* 42 (1999)
- [10] Fogg, B.J.: *Persuasive Technology: Using Computers to Change what We Think and Do*. Morgan Kaufmann. (2003)
- [11] Hurling, R., Catt, M., De Boni, M., Fairley, B.W., Hurst, T., Murray, P., Richardson, A., Sodhi, J.S.: Using internet and mobile phone technology to deliver an automated physical activity program: Randomized controlled trial. *Journal of Medical Internet Research*. 9 (2008)
- [12] IJsselstein, W., de Kort, Y., Midden, C.J.H., Eggen, B., van den Hoven, E.: Persuasive technology for human well-being: Setting the scene. In: IJsselstein, W., de Kort, Y., Midden, C.J.H., Eggen, B., van den Hoven, E. (eds.) *PERSUASIVE*. LNCS, vol. 3962, pp. 1–5. Springer (2006)
- [13] James, J.M., Bolstein, R.: Effect of monetary incentives and follow-up mailings on the response rate and response quality in mail surveys. *Public Opinion Quarterly* 54, 442–453 (1992)
- [14] Johnson, S.S., Paiva, A.L., Cummins, C.O., Johnson, J.L., Dymont, S.J., Wright, J.A., Prochaska, J.O., Prochaska, J.M., Sherman, K.: Transtheoretical model-based multiple behavior intervention for weight management: Effectiveness on a population basis. *Preventive Medicine* 46(3), 238 – 246 (2008), multiple Health Behavior Change (MHBC) Research
- [15] Kaptein, M., Markopoulos, P., de Ruyter, B., Aarts, E.: Can you be persuaded? individual differences in susceptibility to persuasion. *INTERACT* 2009 (2009)

- [16] Kaptein, M., Eckles, D.: Persuasion profiling: Identifying individual differences in influence strategy effectiveness (Dec 2009), unpublished Manuscript submitted for publication
- [17] Kaptein, M., Markopoulos, P., de Ruyter, B., Aarts, E.: Persuasion in ambient intelligence. *Journal Of Ambient Intelligence And Humanized Computing* (dec 2009)
- [18] Kroeze, W., Werkman, A., Brug, J.: A systematic review of randomized trials on the effectiveness of computer-tailored education on physical activity and dietary behaviors. *Annals of Behavioral Medicine*. 31, 205–223 (2006)
- [19] Lacroix, J., Saini, P., Holmes, R.: The relationship between goal difficulty and performance in the context of a physical activity intervention program. In: *MobileHCI* (2008)
- [20] Lacroix, J., Saini, P., Goris, A.: Understanding user cognitions to guide the tailoring of persuasive technology-based physical activity interventions. In: Chatterjee, S., Dev, P. (eds.) *PERSUASIVE*. ACM International Conference Proceeding Series, vol. 350, p. 9. ACM (2009)
- [21] Lockton, D., Harrison, D., Stanton, N.A.: Design with intent: Persuasive technology in a wider context. In: Oinas-Kukkonen, H., Hasle, P.F.V., Harjumaa, M., Segerståhl, K., Øhrstrøm, P. (eds.) *PERSUASIVE*. LNCS, vol. 5033, pp. 274–278. Springer (2008)
- [22] Maheshwari, M., Chatterjee, S., Drew, D.: Exploring the persuasiveness of "just-in-time" motivational messages for obesity management. In: Oinas-Kukkonen, H., Hasle, P.F.V., Harjumaa, M., Segerståhl, K., Øhrstrøm, P. (eds.) *PERSUASIVE*. LNCS, vol. 5033, pp. 258–261. Springer (2008)
- [23] Milgram, S.: *Obedience to Authority*. London: Tavistock. (1974)
- [24] Neville, L.M., O'Hara, B., Milat, A.J.: Computer-tailored dietary behaviour change interventions: a systematic review. *Health Education Research* 24, 699–720 (2009)
- [25] Petty, R.E., Wegener, D.T.: The elaboration likelihood model: Current status and controversies. In: Chaiken, S., Trope, Y. (eds.) *Dual-process theories in social psychology*, p. 4172. Guilford Press, New York (1999)
- [26] Räisänen, T., Oinas-Kukkonen, H., Pahlila, S.: Finding kairos in quitting smoking: Smokers' perceptions of warning pictures. In: Oinas-Kukkonen, H., Hasle, P.F.V., Harjumaa, M., Segerståhl, K., Øhrstrøm, P. (eds.) *PERSUASIVE*. LNCS, vol. 5033, pp. 254–257. Springer (2008)
- [27] Rhoads, K.: How many influence, persuasion, compliance tactics & strategies are there? *Working Psychology* (2007)
- [28] Schroeder, S.: We can do better-improving the health of the american people. *The New England Journal of Medicine*, vol. 357, pp. 1221–1228. (2007)
- [29] Stayman, D.M., Kardes, F.R.: Spontaneous inference processes in advertising: Effects of need for cognition and Self-Monitoring on inference generation and utilization. *Journal of Consumer Psychology* 1(2), 125–142 (1992)
- [30] West, S.G.: Increasing the attractiveness of college cafeteria food: A reactance theory perspective. *Journal of Applied Psychology* 60, 656–658 (1975)