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The interplay between regulatory focus and temporal distance in the health context

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Objectives. This study identifies how the interaction between temporal distance, regulatory focus, and framing of health outcomes affects individuals' intention to adopt a personalized nutrition service.

Design. A 2 (temporal distance: immediate health outcomes vs. delayed health outcomes) \times 2 (regulatory focus: prevention vs. promotion) \times 2 (health outcome framing: illness prevention vs. health promotion) full-factorial between-subjects design.

Methods. In two experiments with samples of 236 and 242 students, regulatory focus was manipulated by asking participants to describe which academic outcomes they want to either achieve or prevent and how they aim to do this. Temporal distance and health outcome framing were manipulated by modifying descriptions of personalized nutrition services. To study the process through which temporal distance, regulatory focus, and health outcome framing affect adoption intention, measures of perceived privacy risk and perceived personalization benefit were included as mediators.

Results. The interaction between temporal distance and regulatory focus had a significant effect on adoption intention, perceived privacy risk, and perceived personalization benefit. For prevention-focused individuals' adoption intention was higher, perceived personalization benefit was higher, and perceived privacy risk was lower when health outcomes were immediate instead of delayed. These effects were not significant for promotion-focused individuals. Health outcome framing affected the interaction between temporal distance and regulatory focus, but only in Study 1. Only perceived personalization benefit served as a mediator.

Conclusion. Tailoring temporal distance to individuals' regulatory focus increases adoption intention for personalized nutrition advice.

Statement of contribution

What is already known on this subject?

- Intention to adopt dietary recommendations results from a cognitive decision-making process.
- Regulatory focus and temporal distance are relevant for the adoption of dietary recommendations.
- Temporal distance and regulatory focus are interrelated.

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What does this study add?

- The interaction between temporal distance and regulatory focus affects adoption intention.
- Interaction between temporal distance and regulatory focus moderates the cognitive process that drives adoption.

Although eating healthily is important for current and future health, it remains a challenge to many (Bouwman, te Molder, Koelen, & van Woerkum, 2009). Following healthy eating recommendations often comes at the cost of eliminating foods that are immediately gratifying, but in the long term unhealthy. Considering temporal discounting, long-term health benefits are likely to be perceived as less valuable in the present (Story, Vlaev, Seymour, Darzi, & Dolan, 2014), which may lead to a situation where the perceived benefits of adhering to dietary recommendations do not outweigh the perceived costs (Chapman & Elstein, 1995). To increase benefit perceptions, dietary recommendations are becoming more and more individualized, a field known as personalized nutrition (Gibney & Walsh, 2013). Using consumers' personal health information, personalized nutrition services tailor dietary recommendations to individual consumer needs (Ronteltap, Van Trijp, Berezowska, & Goossens, 2013). Service design may maximize consumers' intention to adopt personalized nutrition services (Berezowska *et al.*, 2014). Under different regulatory foci (individuals in a promotion or prevention state), the present paper explores two of such design factors: (1) temporal distance (immediate vs. long-term costs and health benefits); and (2) framing of health outcomes (illness prevention vs. health promotion).

Individuals' intention to adopt a personalized nutrition service is affected by the specific health goal that individuals want to accomplish. Individuals engage in health behaviour to prevent illness and/or to promote health (Gomez, Borges, & Pechmann, 2013). Which of the two health goals is most salient relates to an individual's regulatory orientation or regulatory focus (Higgins, 1997). In the case of a prevention focus, goals are driven by the need for safety and security, while in the case of a promotion focus, goals result from the need for accomplishment and advancement (Higgins, 2000). Consequently, prevention-focused individuals are likely to be oriented towards the prevention of illness, whereas promotion-focused individuals may be more oriented towards the promotion of health. Regulatory focus is a so-called trait with state properties (e.g., Motyka *et al.*, 2014), which implies that individuals are chronically more focussed on either prevention or promotion (i.e., the personality trait), but that their focus may shift dependent on the specific situation or context (i.e., situation-dependent state). Hence, the effect of regulatory focus on adoption intention is likely to depend on both one's personality and the situation.

Prior studies suggest that temporal distance and regulatory focus are interrelated (Mogilner, Aaker, & Pennington, 2008; Pennington & Roese, 2003). More specifically, individuals in a promotion-focused state perceive goals that should be accomplished in the distant future as more relevant than goals that should be accomplished in the near future (Steinhart, Mazursky, & Kamins, 2013). In the case of a prevention focus, however, goals in the near future are seen as more relevant than goals in the distant future. Similarly, goals of promotion-focused individuals lie further in the future than goals of prevention-focused individuals (Pennington & Roese, 2003). Considering that both regulatory focus and temporal distance are relevant for the adoption of personalized nutrition services, it may be that individuals' adoption intention increases when the temporal distance of such service fits one's regulatory focus. Currently, evidence for such effect is, however, lacking. Hence, we suggest that:

Hypothesis 1a: For prevention-focused individuals, intention to adopt a personalized nutrition service is higher when outcomes of the advice are presented as immediate rather than delayed.

Hypothesis 1b: For promotion-focused individuals, intention to adopt a personalized nutrition service is higher when outcomes of the advice are presented as delayed rather than immediate.

The adoption of a personalized nutrition service is likely to result from cognitive decision-making (Berezowska, Fischer, Ronteltap, Van der Lans, & Van Trijp, 2015). Currently, little is known about the cognitive process that mediates the effect of temporal distance, regulatory focus, and their interplay on adoption intention. Such understanding may provide insights for designing successful personalized nutrition services. Perceptions of risk and benefit are two cognitive factors that may mediate the effect of the interplay between regulatory focus and temporal distance on goal attainment, as individuals' intention to adopt a personalized nutrition service is determined by their attitude (Póinhos *et al.*, 2014), of which risk and benefit perceptions are vital components (Berezowska *et al.*, 2014, 2015; Ronteltap, van Trijp, & Renes, 2007). Risk and benefit perceptions depend on whether the outcomes of their actions concern the present or the future (Eyal, Liberman, Trope, & Walther, 2004). More specifically, as temporal distance increases (i.e., behavioural outcomes lie further in the future) risk perceptions decrease and benefit perceptions increase. Furthermore, it seems that prevention-focused individuals are more likely to focus on risks, while promotion-focused individuals are likely to focus on benefits (Wallace & Chen, 2006; Werth & Forster, 2007). Based on these findings, the effect of the interplay between temporal distance and regulatory focus on adoption intention is considered to be (at least partly) mediated through individuals' risk and benefit perceptions. We therefore hypothesize that:

Hypothesis 2: The effect of temporal distance and health outcome framing on adoption intention is mediated by perceived personalization benefit.

Hypothesis 3: The effect of temporal distance and health outcome framing on adoption intention is mediated by perceived privacy risk.

Hypothesis 4a: In the case of prevention-focused individuals, perceptions of personalization benefit are higher when health outcomes are immediate rather than delayed.

Hypothesis 4b: In the case of promotion-focused individuals, perceptions of personalization benefit are higher when health outcomes are delayed rather than immediate.

Hypothesis 5a: In the case of prevention-focused individuals, perceptions of privacy risk are lower when health outcomes are immediate rather than delayed.

Hypothesis 5b: In the case of promotion-focused individuals, perceptions of privacy risk are lower when health outcomes are delayed rather than immediate.

Individuals' intention to adopt a personalized nutrition service may differ depending on whether the recommendations are framed in terms of gains or non-losses. Promotion-focused individuals are more likely to adopt health interventions that are framed in terms of gains and prevention-focused individuals are more likely to adopt health interventions that are framed in terms of non-losses (Cesario, Grant, & Higgins, 2004; Hong & Lee, 2008; Spiegel, Grant-Pillow, & Higgins, 2004). The evidence for this regulatory fit effect is, however, mixed as shown by Ludolph and Schulz (2015). To identify whether framing affects the interaction between temporal distance and regulatory focus, this study frames health outcomes in terms of health promotion (i.e., gain) or illness prevention (i.e., non-loss), hypothesizing:

Hypothesis 6: The interaction between temporal distance and regulatory focus is moderated by the framing of provided health outcomes.

STUDY I

Methods

Design and sample

The study followed a 2 (temporal distance: immediate vs. delayed health outcomes) \times 2 (health outcome framing: prevent illness vs. promote health) \times 2 (regulatory focus: prevention vs. promotion) full-factorial between-subjects design. Participants were 236 Dutch (under) graduate students from different disciplines. A power calculation conducted to determine sample size that allows for the identification of medium to large effects (partial $\eta^2 = .25$ following Cohen, 1992) for the overall model suggested 30 participants per group.¹ The age of the participants ranged from 17 to 28 ($M = 21.7$, $SD = 1.92$), 34% of the sample was male. Data were collected late spring 2015.

Manipulations, stimuli, and measures versus

Temporal distance and health outcome framing were manipulated by creating flyers that represented fictitious personalized nutrition services. Temporal distance was manipulated by making the flyer state that engaging with the service provides health outcomes for the upcoming summer (immediate health outcomes) or after one has turned 50 years old (delayed health outcomes). Health outcome framing was manipulated by varying health outcomes that were provided by a personalized nutrition service. In case of the prevent illness frame, the service offered to prevent fatigue; in the case of the promote health frame, the service offered to increase energy levels this summer or be in great shape after turning 50 years old (detailed flyer content is provided in Appendix A). To make sure that temporal distance and health outcome framing manipulations indeed induced perceptions of immediate versus delayed health outcomes and illness prevention versus health promotion, flyer content was pilot tested during several consecutive tests ($n = 10$, per pilot test). Using a 5-point scale ranging from very unrealistic to very realistic, we also assessed whether flyer content was perceived as sufficiently real. Flyers were piloted and revised until participants considered both the manipulations and flyer realness as good ($M = 3.5$, $SD = 0.85$). To control for flyer layout, layout application was counterbalanced (Appendix B). To elicit benefit perceptions, the flyers stated that personalized

¹ Corresponds to minimum effect sizes of 0.18 for main and interaction effects; calculation conducted with G^* power.

nutrition advice was provided by a qualified dietitian and based on innovative techniques that significantly increased effectiveness when compared to regular dietary advice. To prompt perceptions of privacy risk flyers stated that one of the innovative techniques was DNA analysis and that nutrition advice was refunded by one's health insurance company, which suggests that an insurer may access one's genetic profile and use it for purposes other than initially intended. The prompts to induce personalization benefit and privacy risk were derived from extensive focus group discussions reported in Berezowska *et al.* (2014). As this study aimed to investigate the cognitive process that mediates the effect of temporal distance and regulatory focus on adoption intention, rather than establishing individuals' risk and benefit perceptions, no in-depth explanation of personalized nutrition was provided.

Regulatory focus was manipulated with the procedure established by Lockwood, Jordan, and Kunda (2002). To induce promotion focus, participants were asked to write a short statement on which positive academic outcomes they wanted to achieve and how they wanted to achieve those outcomes. To induce prevention focus, participants were asked to write a short statement on which negative academic outcomes they wanted to prevent and how they wanted to prevent those outcomes.

Adoption intention was measured on a reliable 7-point scale ranging from strongly disagree to strongly agree using three items (Cronbach's alpha = .89): (1) I would consider using this service; (2) I intend to use this service; and (3) I would recommend this service to others (Berezowska *et al.*, 2015).

Manipulation checks were conducted using semantic differential scales ranging from immediate to delayed or illness prevention to health promotion and showed that the temporal distance and health outcome framing manipulations operated as intended. More specifically, there was a significant effect of temporal distance on the extent to which participants perceived the outcomes of the personalized nutrition service as immediate ($M = 2.96$, $SE = .11$) or delayed ($M = 4.10$, $SE = .11$), $F(1, 234) = 48.61$, $p < .001$. Furthermore, there was a significant effect of health outcome framing on the extent to which participants perceived the personalized nutrition service to focus on illness prevention ($M = 1.91$, $SE = .11$) or health promotion ($M = 3.73$, $SE = .11$), $F(1, 234) = 130.14$, $p < .001$. The manipulation check of the regulatory focus manipulation conducted at the end of the experiment used a semantic differential scale from promoting positive to preventing negative outcomes did not show significant effects, $F(1, 234) = 1.59$, $p = .21$.

Procedure

Participants were welcomed into a classroom and seated at one of the available computers. Participants were told they would participate in a study consisting of several parts. The first part had an unrelated topic. In the second part, participants were randomly assigned to one of the two regulatory focus conditions. In the third part, participants were randomly presented with one of the four personalized nutrition service flyers² and stated their intention to adopt the service that it described. Finally, participants reported their gender, age, and field of study. Participants received a snack to compensate their effort.

² Participants were also shown a second personalized nutrition service flyer, but as there were indications that the evaluation of the second flyer was influenced by the evaluation of the first one, evaluations of the second flyer were excluded from the analysis. Flyer 2 was introduced after the full completion of all measures related to Flyer 1.

Results

A factorial ANOVA showed a significant overall effect, $F(7, 228) = 3.20, p < .01$, partial $\eta^2 = .09$. No main effect of temporal distance, $F(1, 228) = 0.71, p = .40$, partial $\eta^2 < .01$, health outcome framing, $F(1, 228) = 2.09, p = .15$, partial $\eta^2 = .01$, or regulatory focus, $F(1, 228) = 0.70, p = .40$, partial $\eta^2 < .01$, on adoption intention was found.

There was a significant interaction effect of regulatory focus and temporal distance on adoption intention, $F(1, 228) = 12.31, p = .001$, partial $\eta^2 = .05$. Simple-effects analyses showed that prevention-focused participants had a higher adoption intention when health outcomes were immediate ($M = 3.49, SE = .21$) instead of delayed ($M = 2.63, SE = .20$), $F(1, 228) = 9.25, p = .003$, partial $\eta^2 = .04$. For promotion-focused participants, a trend towards higher adoption intention for delayed ($M = 3.49, SE = .21$) instead of immediate health outcomes was found ($M = 2.96, SE = .19$), $F(1, 228) = 3.63, p = .058$, partial $\eta^2 = .02$. The two-way interactions between regulatory focus and health outcome framing, $F(1, 228) = 2.84, p = .093$, partial $\eta^2 = .01$, or temporal distance and health outcome framing, $F(1, 228) = 0.01, p = .91$, partial $\eta^2 < .01$, were not significant.

There was a significant three-way interaction between temporal distance, health outcome framing, and regulatory focus, $F(1, 228) = 5.10, p = .025$, partial $\eta^2 = .02$ (Figure 1). Simple-effects analyses were used to interpret the two-way interaction between regulatory focus and temporal distance for different health outcome framings. Prevent illness frame participants with a prevention focus were more likely to adopt a personalized nutrition service when health outcomes were immediate ($M = 3.68, SE = .32$) instead of delayed ($M = 2.39, SE = .27$), $F(1, 228) = 9.62, p = .002$, partial $\eta^2 = .04$. Participants with a promotion focus, on the other hand, were more likely to adopt a personalized nutrition service when health outcomes were delayed ($M = 4.04, SE = .30$) instead of immediate ($M = 3.04, SE = .25$), $F(1, 228) = 6.67, p = .010$, partial $\eta^2 = .03$. For the promote health frame, the interaction between regulatory focus and temporal distance was not significant (F 's < 1.3 , all, partial $\eta^2 < .01$). Appendix S1 provides an overview of the observed means and standard deviations.

Discussion

Study 1 supports the expectation that prevention-focused individuals are more likely to prioritize health outcomes in the present, while promotion-focused individuals are more likely to prioritize health outcomes in the future. This difference between prevention- and promotion-focused individuals is, however, nullified when health outcomes are framed in

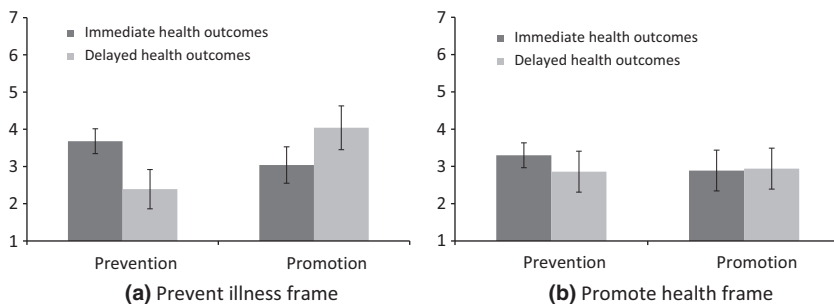


Figure 1. Three-way interaction between temporal distance, health outcome framing, and regulatory focus.

terms of health promotion instead of illness prevention. When interpreting the findings of Study 1, a reason for caution is the non-significant result of the regulatory focus manipulation check. However, as we used a well-established procedure and did find results that align with our hypotheses, we argue that the ineffectiveness of the manipulation check is likely to be caused by the extinction of the effect over the time span of the experiment. More specifically, it may be that the manipulation either worked for a short period or that participants were able to fulfil their motivational goal (preventing negative or promoting positive outcomes) by selecting a service. The intention measure contained a 'recommend to others' item that only seems indirectly relevant to the adoption of a service. However, as this item showed high internal consistency with the other items (indicated by Cronbach's $\alpha = .89$), it was decided to retain the item. Hence, the findings of Study 1 provide sufficient ground to investigate whether the effect of temporal distance, health outcome framing, and regulatory focus on adoption intention is mediated by individuals' perceptions of privacy risk and personalization benefit. Study 2, therefore, aims to replicate the results of Study 1 and in addition extends the research with privacy risk and personalization benefit perceptions as mediators.

STUDY 2

Methods

Study 2 was identical to Study 1, with the exception that the adoption intention items were followed by measures of perceived personalization benefit and perceived privacy risk (Table 1). Participants were 242 students aged between 16 and 31 years ($M = 20.8$, $SD = 1.72$), of whom 27.7% was male. Sample size was based on 80% power to detect a medium to large effects in the three way interaction. Data were collected late spring 2015. Mediation effects were tested using PROCESS for SPSS (Hayes, 2013) with a bias-corrected bootstrap estimation for 5,000 samples and a 95% confidence interval.

Results

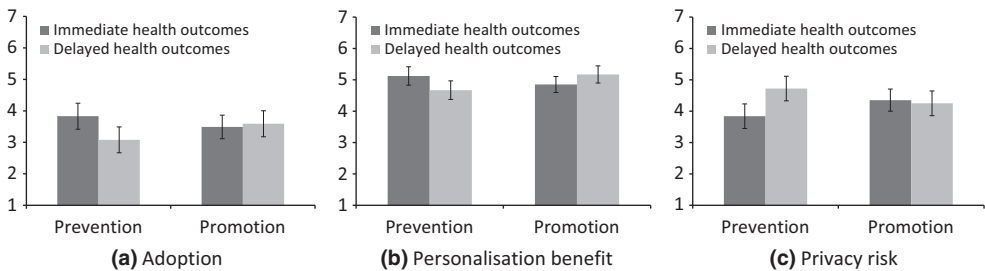
Adoption intention

A factorial ANOVA showed a significant overall effect, $F(7, 234) = 2.06$, $p < .05$, partial $\eta^2 = .06$. A factorial ANOVA with adoption intention predicted by temporal distance, health outcome framing, and regulatory focus showed a significant main effect of health outcome framing. Adoption intention was higher for the prevent illness frame ($M = 3.74$, $SE = .15$) than for the promote health frame ($M = 3.25$, $SE = .14$), $F(1, 234) = 5.63$, $p = .019$, partial $\eta^2 = .02$. There was no main effect of regulatory focus, $F(1, 234) = 0.18$, $p = .67$, or temporal distance, $F(1, 234) = 2.45$, $p = .12$, on adoption intention.

Replicating Study 1, there was a significant interaction effect of regulatory focus and temporal distance on adoption intention, $F(1, 234) = 4.24$, $p = .041$, partial $\eta^2 = .02$ (Figure 2). Simple-effects analysis confirmed the effects found in Study 1. For prevention-focused participants, adoption intention was higher when health outcomes were immediate ($M = 3.83$, $SE = .21$) instead of delayed ($M = 3.08$, $SE = .19$), $F(1, 234) = 6.70$, $p = .010$, partial $\eta^2 = .03$. The effect of temporal distance on adoption intention was not significant for promotion-focused participants, $F(1, 234) = 0.119$, $p = .731$, partial $\eta^2 < .01$. None of the other two- or three-way interactions were significant (all F 's < 0.8 , p 's $> .35$, partial η^2 's $< .01$).

Table 1. Measures Study 2

Construct	Question	Items	Anchors	Cronbach's alpha
Adoption intention		<ul style="list-style-type: none"> • I would consider using this service • I intend to use this service • I would recommend this service to others 	I = 'strongly disagree' to 7 = 'strongly agree'	.89
Personalization benefit	Compared to general nutrition advice, this service offers me nutrition advice that is	<ul style="list-style-type: none"> • More accurately tailored to my health needs • More relevant for my health • More beneficial for my health 	I = 'strongly disagree' to 7 = 'strongly agree'	.83
Privacy risk	I think that using this service	<ul style="list-style-type: none"> • Involves many privacy-related risks • Is a threat to my privacy • Creates a high risk for the loss of my privacy 	I = 'strongly disagree' to 7 = 'strongly agree'	.90

**Figure 2.** Interaction between regulatory focus and temporal distance for adoption intention, personalization benefit, and privacy risk.

Personalization benefit

A factorial ANOVA with perceived personalization benefit predicted by temporal distance, health outcome framing, and regulatory focus showed a significant main effect of health outcome framing. Benefit perception was higher for the prevent illness frame ($M = 5.10$, $SE = .10$) than for the promote health frame ($M = 4.80$, $SE = .10$), $F(1, 234) = 4.40$, $p = .037$, partial $\eta^2 = .02$. There was no main effect of regulatory focus, $F(1, 234) = 0.61$, $p = .44$, partial $\eta^2 = < .01$, or temporal distance, $F(1, 234) = 0.23$, $p = .63$, partial $\eta^2 = < .01$, on perceived personalization benefit.

There was a significant interaction effect of regulatory focus and temporal distance on perceived personalization benefit, $F(1, 234) = 7.39$, $p = .007$, partial $\eta^2 = .03$. Simple-effects analyses showed that prevention-focused participants had a higher perception of personalization benefit when health outcomes were immediate ($M = 5.12$, $SE = .15$) instead of delayed ($M = 4.67$, $SE = .13$), $F(1, 234) = 5.21$, $p = .023$, partial $\eta^2 = .02$. The effect of temporal distance on perceived personalization benefit was not significant for promotion-focused participants, $F(1, 234) = 2.46$, $p = .118$, partial $\eta^2 = .01$. None of the

other two- or three-way interactions were significant (all F 's < 2.7, p 's > .10, partial η^2 's < .012).

Privacy risk

A factorial ANOVA where perceived privacy risk was predicted by temporal distance, health outcome framing, and regulatory focus showed a significant main effect of temporal distance. Risk perception was lower when health outcomes were immediate ($M = 4.10$, $SE = .14$) instead of delayed ($M = 4.48$, $SE = .13$), $F(1, 234) = 4.07$, $p = .045$, partial $\eta^2 = .02$. There was no main effect of regulatory focus, $F(1, 234) = 0.01$, $p = .91$, partial $\eta^2 < .01$, or health outcome framing, $F(1, 234) = 0.0$, $p = .97$, partial $\eta^2 < .01$, on perceived privacy risk.

There was a significant interaction effect of regulatory focus and temporal distance on perceived privacy risk, $F(1, 234) = 6.62$, $p = .011$, partial $\eta^2 = .03$. Simple-effects analyses showed that prevention-focused participants had a lower perception of privacy risk when health outcomes were immediate ($M = 3.84$, $SE = .20$) instead of delayed ($M = 4.72$, $SE = .18$), $F(1, 234) = 10.74$, $p = .001$, partial $\eta^2 = .04$. The effect of temporal distance on perceived privacy risk was not significant for promotion-focused participants, $F(1, 234) = 0.15$, $p = .697$ partial $\eta^2 < .01$. None of the other two- or three-way interactions were significant (all F 's < 0.7, p 's > .79, partial η^2 's < .01).

Mediation analysis

A mediation analysis was conducted to investigate whether significant effects of health outcome framing and interaction between regulatory focus and temporal distance on adoption intention were mediated by perceptions of privacy risk and/or personalization benefit. Perceived personalization benefit ($b = 0.71$, $t = 8.97$, $p < .001$) determined adoption intention ($R^2 = 0.26$). Perceived privacy risk did not determine ($b = -0.09$, $t = -1.51$, $p = .13$) adoption intention.

The main effect of health outcome framing on adoption intention was fully mediated by perceived personalization benefit. The direct effect of health outcome framing on adoption intention was not significant ($b = -0.14$, $p = .12$). The indirect effect of health outcome framing on adoption intention through benefit perception was $b = -0.11$ (95% CI [-0.21, -0.02]), with a moderate effect size of $\kappa^2 = .08$ (95% CI [0.02, 0.14]).³

The effect of the interaction between regulatory focus and temporal distance on adoption intention was also fully mediated by perceived personalization benefit. The direct effect of the interaction between regulatory focus and temporal distance on adoption intention was not significant at $b = 0.07$, $p = .45$. The indirect effect of the interaction between regulatory focus and temporal distance on adoption intention was $b = 0.15$ (95% CI [0.06, 0.25]), with a moderate effect size of $\kappa^2 = .10$ (95% CI [0.04, 0.17]).

Discussion

Study 2 shows that the interaction between regulatory focus and temporal distance determines not only adoption intention, but also perceived personalization benefit and

³ As κ^2 can only be estimated for a single indirect effect paths through risk perception were omitted. Separate analyses with parallel mediators confirmed the indirect effects through risk perception were not significant for health outcome framing $b < -0.01$ (95% CI [-0.03, 0.03]), nor regulatory focus temporal distance interaction $b = 0.02$ (95% CI [-0.01, 0.08]).

perceived privacy risk, which replicates and extends the results of Study 1. The three-way interaction from study 1 (partial $\eta^2 = .02$) was not replicated in Study 2 (partial $\eta^2 = .002$). Furthermore, Study 2 showed a main effect of health outcome framing on adoption intention (partial $\eta^2 = .02$) where Study 1 did not (partial $\eta^2 = .01$). The inconsistencies in the findings of Study 1 and Study 2 cannot be explained by experimental differences as risk and benefit perception was assessed after measuring adoption intention.

Temporal distance had a significant effect on perceived privacy risk but not on perceived personalization benefit, which provides partial support for our expectations. However, rather than decrease over time, perceptions of privacy risk were higher when temporal distance was high. This finding may have occurred due to the fact that privacy risk perceptions depend on the extent to which individuals feel in control over their personal information (Phelps, Nowak, & Ferrell, 2000), and information control is likely to decrease as time passes. Against expectation, perceptions of privacy risk were not a mediator.

GENERAL DISCUSSION

Two experiments confirmed that adoption intention is determined by the interaction between regulatory focus and temporal distance. In line with Hypothesis 1a, individuals who strived for safety and security (i.e., prevention focus) preferred to adopt a personalized nutrition service that offers immediate rather than delayed health outcomes. Rather than increase when provided health outcomes are delayed instead of immediate (Hypothesis 1b), the adoption intention of individuals who strived for accomplishment and advancement (i.e., promotion focus) remained unaffected by temporal distance.

Mediated through perceived personalization benefit, in line with Hypothesis 2, the interaction between regulatory focus and temporal distance affected individuals' intention to adopt a personalized nutrition service. Prevention-focused individuals had higher perceptions of personalization benefit when nutritional recommendations offered immediate rather than delayed health outcomes (Hypothesis 4a). However, rather than increase when provided health outcomes are delayed instead of immediate (Hypothesis 4b), for promotion-focused individuals temporal distance did not have an effect on perceived personalization benefit. The results align with findings that behavioural motivation moderates the relationship between perceived personalization benefit and its antecedents (Berezowska, Fischer, & Van Trijp, 2017). The current study extends this by demonstrating that not only the reason *why* individuals are motivated to adopt services but also *what* they want to achieve through adoption influences individuals' perceptions of personalization benefit.

Prevention-focused individuals had lower perceptions of privacy risk when nutritional recommendations offered immediate rather than delayed health outcomes (Hypothesis 5a). However, rather than decrease when provided health outcomes are delayed instead of immediate (Hypothesis 5b), in the case of promotion-focused individuals temporal distance did not influence perceived privacy risk. In contrast to Hypothesis 3, perceived privacy risk was not a significant mediator in the cognitive process as perceived privacy risk did not affect adoption intention. Privacy concern was spontaneously voiced in other studies on the topic (Berezowska *et al.*, 2014), suggesting perceived privacy risk should be relevant. To create a research setting that closely fits the real world, stimulus materials highlighted positive health outcomes of personalized nutrition, which may explain why perceived privacy risk did not contribute to adoption intention. Considering that

individuals often ignore privacy risks when benefits are present (Belanger & Crossler, 2011; Pavlou, 2011; Smith, Dinev, & Xu, 2011), the salience of the positive health outcomes may have downplayed the importance of privacy risk. When benefits are less prominent, it may be that perceived privacy risk will affect adoption. Future research seems warranted to determine to what extent and in which circumstances perceived privacy risk matters for these types of services.

The finding that promotion-focused individuals were insensitive to temporal distance could be further understood by drawing on construal level theory (Trope & Liberman, 2010). Construal level theory proposes that individuals reason about objects and events from the perspective of either a low (i.e., emphasis is on details) or high (i.e., emphasis is on the bigger picture) construal level. Compared to low construal, individuals who reason from a high construal mindset are more likely to engage in global information processing (Forster & Higgins, 2005) that revolves around the desirability of behavioural outcomes (Sagristano, Trope, & Liberman, 2002). As a promotion focus is associated with high construal reasoning (Lee, Keller, & Sternthal, 2010), it is likely that promotion-focused individuals paid attention to whether the adoption of a personalized nutrition service will result in positive health outcomes at all rather than to when the health outcomes will occur. Future research should validate this explanation by showing that high construal reasoning leads to similar outcomes as promotion-focused regulatory orientations.

The current study did not find support for the regulatory fit hypothesis (Hypothesis 6), which predicts an increase in adoption intention when the framing of a health message matches individuals' regulatory orientation (Higgins, 2000). The results of Study 1 did show that the interaction between regulatory focus and temporal distance is affected by framing. Prevention-focused individuals preferred immediate and promotion-focused individuals preferred delayed health outcomes, but only when the health outcomes were framed as illness prevention, and not health promotion. Although these results suggest that health promotion frames allow to align temporal distance with regulatory focus, the results of Study 2 do not replicate this suggestion and instead show that health promotion frames reduce both benefits perceptions and adoption intention. Thus, similar to other studies (Latimer *et al.*, 2008; Martinez, Duncan, Rivers, Latimer, & Salovey, 2013; Pfeffer, 2013), the current paper shows that a regulatory fit effect towards acceptance of delayed versus immediate effects is difficult to prove. The current findings, therefore, align with the idea that differences between loss versus gain frames may be less important than often assumed (Van't Riet *et al.*, 2016), as these differences may be subject to subtle effects of other interacting variables. The consistency in main and two interaction effects across the two studies suggests that there is a stable mechanism which steers the adoption intention of personalized nutrition services. However, its effect is small and therefore not of immediate practical relevance. To increase practical relevance, it may be worthwhile for future research to investigate additional framing effects or identify moderating variables such a health motivation.

Although this study aimed to test theoretical rather than population relevant differences, the sample's relative homogeneity in term of age and education level (i.e., student sample) may warrant some caution with regard to the generalization of our findings. For instance, prior research shows that young adults are more inclined to disclose personal information (Nosko, Wood, & Molema, 2010) and consequently may be less sensitive to potential privacy risks. Furthermore, when thinking about the future adolescents are mainly concerned with relatively short-term outcomes related to education and career (Nurmi, 1991), which might have downplayed the importance of future health outcomes. Considering the potential limitations resulting from the use of a

student sample, we recommend future research to confirm the present findings with a more representative sample.

The current study investigated the intention to adopt personalized nutrition services, which in a diet context is expected to explain about 20% of actual behaviour (McEachan, Conner, Taylor, & Lawton, 2011). Adoption intention is, however, only the first step towards a healthier diet. Future research should show to what extent the findings of this study are reflected both in adopting a personalized nutrition service and a healthy diet.

Conclusion

This study advances health-related theory by showing how the motivation that drives individuals' health goals affects their preference for short- or long-term health outcomes. Individuals who want to avoid disease prefer short-term health outcomes, while for individuals who want to optimize health the timing of health outcomes seems irrelevant. From a practical point of view, these findings imply that to stimulate the adoption of personalized nutrition services, these should be designed in a way that places their health effects as close in time as possible.

Conflict of interest

All authors declare no conflict of interest.

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Supporting Information

The following supporting information may be found in the online edition of the article:

Appendix S1. Observed means and standard deviations for Study 1 and Study 2.

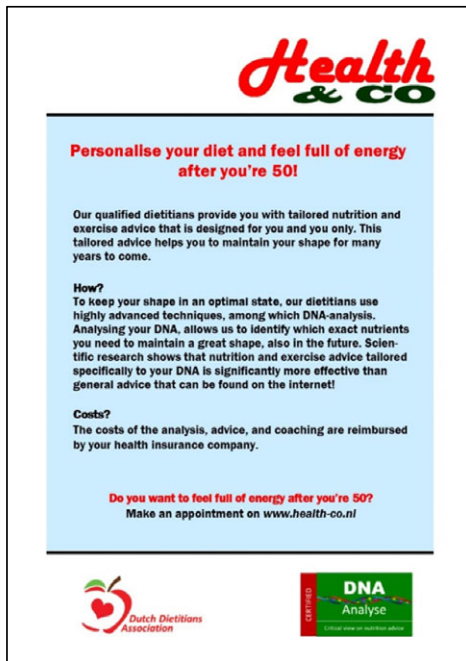
Appendix A: Content of the personalized nutrition service flyers

	Immediate health outcomes	Delayed health outcomes
Illness prevention	<p><i>Personalize your diet and prevent feeling drained in the summer!</i></p> <p>Our qualified dietitians provide you with tailored nutrition and exercise advice that is designed for you and you only. This tailored advice helps you to prevent fatigue.</p> <p><i>How?</i></p> <p>To prevent fatigue, our dietitians use highly advanced techniques, among which DNA analysis. Analysing your DNA allows us to identify which exact nutrients you need to minimize the likelihood of fatigue. Scientific research shows that nutrition and exercise advice tailored specifically to your DNA is significantly more effective than general advice that can be found on the Internet!</p> <p><i>Costs?</i></p> <p>The costs of the analysis, advice, and coaching are reimbursed by your health insurance company.</p> <p><i>Do you want to prevent feeling drained in the summer?</i></p> <p>Make an appointment on . . .</p>	<p><i>Personalize your diet and prevent health problems after you're 50!</i></p> <p>Our qualified dietitians provide you with tailored nutrition and exercise advice that is designed for you and you only. This tailored advice helps you to prevent health loss as you get older.</p> <p><i>How?</i></p> <p>To prevent health loss, our dietitians use highly advanced techniques, among which DNA analysis. Analysing your DNA allows us to identify which exact nutrients you need to make sure that your health remains optimal. Scientific research shows that nutrition and exercise advice tailored specifically to your DNA is significantly more effective than general advice that can be found on the Internet!</p> <p><i>Costs?</i></p> <p>The costs of the analysis, advice, and coaching are reimbursed by your health insurance company.</p> <p><i>Do you want to prevent health problems after you're 50?</i></p> <p>Make an appointment on . . .</p>
Health promotion	<p><i>Personalize your diet and start your summer in an even better shape!</i></p> <p>Our qualified dietitians provide you with tailored nutrition and exercise advice designed for you and you only. This tailored advice helps you to increase your energy level.</p> <p><i>How?</i></p> <p>To boost your energy, our dietitians use highly advanced techniques, among which DNA analysis. Analysing your DNA allows us to identify which exact nutrients you need to enhance your energy level. Scientific research shows that nutrition and exercise</p>	<p><i>Personalize your diet and feel full of energy after you're 50!</i></p> <p>Our qualified dietitians provide you with tailored nutrition and exercise advice that is designed for you and you only. This tailored advice helps you to maintain your shape for many years to come.</p> <p><i>How?</i></p> <p>To keep your shape in an optimal state, our dietitians use highly advanced techniques, among which DNA analysis. Analysing your DNA allows us to identify which exact nutrients you need to maintain a great shape, also in the future. Scientific research shows that</p>

Continued

Appendix A: (Continued)

Immediate health outcomes	Delayed health outcomes
<p>advice tailored specifically to your DNA is significantly more effective than general advice that can be found on the Internet!</p> <p>Costs? The costs of the analysis, advice, and coaching are reimbursed by your health insurance company.</p> <p><i>Do you want to start your summer in an even better shape?</i> Make an appointment on . . .</p>	<p>nutrition and exercise advice tailored specifically to your DNA is significantly more effective than general advice that can be found on the Internet!</p> <p>Costs? The costs of the analysis, advice, and coaching are reimbursed by your health insurance company.</p> <p><i>Do you want to feel full of energy after you're 50?</i> Make an appointment on . . .</p>



Health & CO



Personalise your diet and feel full of energy after you're 50!

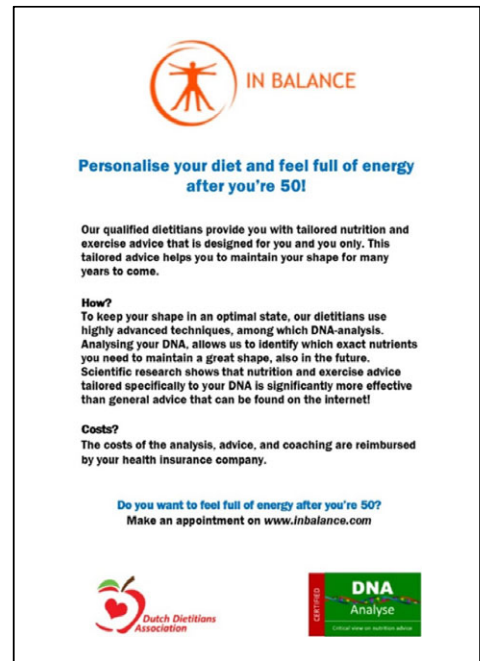
Our qualified dietitians provide you with tailored nutrition and exercise advice that is designed for you and you only. This tailored advice helps you to maintain your shape for many years to come.


How?
To keep your shape in an optimal state, our dietitians use highly advanced techniques, among which DNA-analysis. Analysing your DNA, allows us to identify which exact nutrients you need to maintain a great shape, also in the future. Scientific research shows that nutrition and exercise advice tailored specifically to your DNA is significantly more effective than general advice that can be found on the internet!

Costs?
The costs of the analysis, advice, and coaching are reimbursed by your health insurance company.

Do you want to feel full of energy after you're 50?
Make an appointment on www.health-co.nl



 **IN BALANCE**



Personalise your diet and feel full of energy after you're 50!

Our qualified dietitians provide you with tailored nutrition and exercise advice that is designed for you and you only. This tailored advice helps you to maintain your shape for many years to come.

How?
To keep your shape in an optimal state, our dietitians use highly advanced techniques, among which DNA-analysis. Analysing your DNA, allows us to identify which exact nutrients you need to maintain a great shape, also in the future. Scientific research shows that nutrition and exercise advice tailored specifically to your DNA is significantly more effective than general advice that can be found on the internet!

Costs?
The costs of the analysis, advice, and coaching are reimbursed by your health insurance company.

Do you want to feel full of energy after you're 50?
Make an appointment on www.inbalance.com

Appendix B: Layout of the personalized nutrition service flyers [Colour figure can be viewed at wileyonlinelibrary.com]