

# Consumer preferences for different formats of personalised nutrition and health services

## Authors (in alphabetical order):

Emily Bouwman (WUR)

Garnt Dijksterhuis (WUR)

Koen Hogenelst (TNO)

Machiel Reinders (WUR)

Danny Taufik (WUR)

René de Wijk (WUR)



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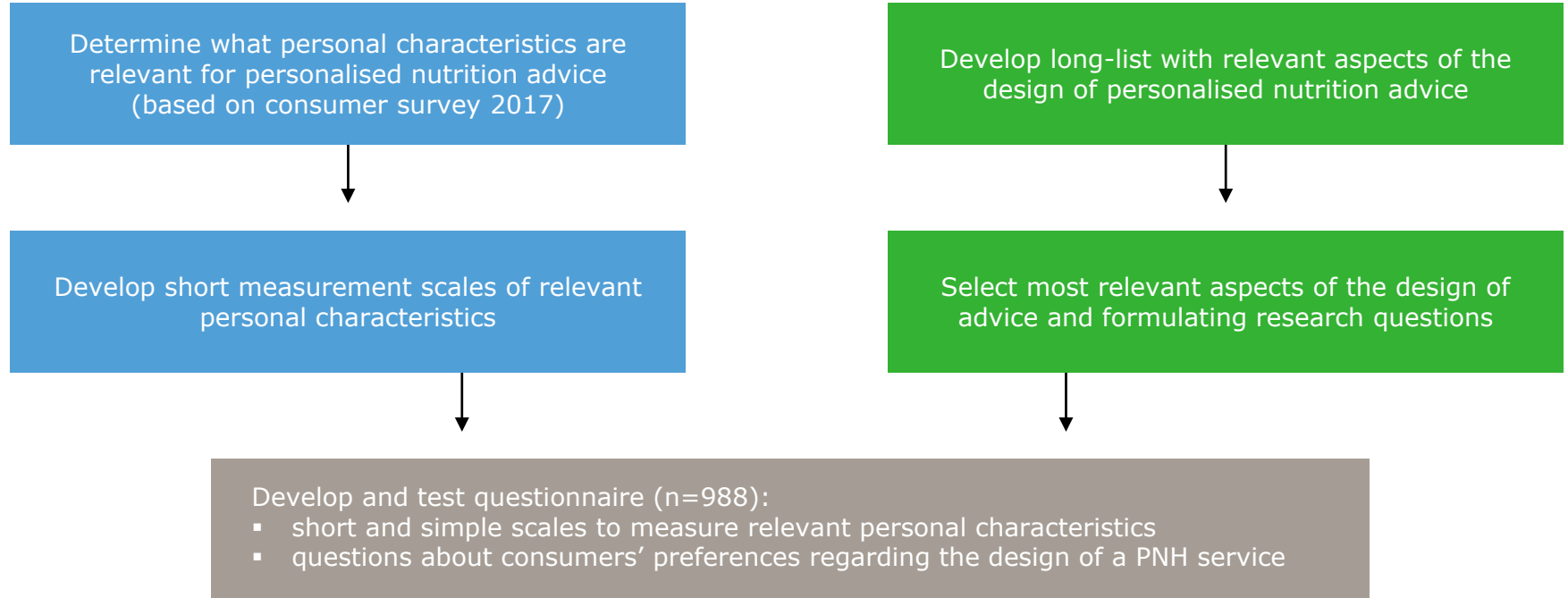
# Introduction

- One-size-fits-all attempts to turn the tide of obesity have not been very successful and the incidence of non-communicable dietary related diseases, such as type2 diabetes, is growing (*WHO, 2011*).
- There are indications that personalised nutrition and health advices, based on an individual's physiological and psychosocial characteristics, may be more effective (*Celis-Morales et al., 2016; de Toro-Martín et al., 2017; Krebs et al., 2010; Zeevi et al., 2015*).
- ICT developments enable momentum for personalised nutrition, e.g. smart wearables, health parameter monitoring, big data handling, and the high penetration rate of the smartphone in the western population.
- What should be the design of personalised nutrition advice to stimulate consumer acceptance of these personalised services?

# Aim and scope

- **Aim:** Enhanced insight into what personalised feedback and advice should look like and how this differs between different types of consumers
- **Main research question:** What are consumers' preferences for different formats of personalised nutrition and health (PNH) services and how do these preferences differ for different types of consumers?
- **Relevance:**
  - The format or design in which personalised advice is communicated has a pivotal role in changing behaviour and allows companies to further develop their PNH products and services.
  - Relevant insights from social psychology and marketing research are needed to compose personal feedback and advice for consumers in such a way that is effective in helping them to choose and maintain an optimal lifestyle.

# Research building blocks



# Summary



# Most relevant aspects design of PNH services

- A **digital platform** is preferred (i.e., website, email or smartphone-app), in which consumers can look up the advice themselves (i.e., **pull** messages instead of push messages). The majority likes to receive **daily or weekly** advice in the **morning**, at **home**.
- A small majority wants to start changing their dietary pattern by focusing on **a single meal moment**; advice should be **brief** and have a **neutral** or **motivating tone**, with a **positive framing**.
- A majority wants feedback on their dietary pattern and health status by means of a **score with explanation**, displayed in a **combination of text and graph**.

# Preferred design of PNH services can be related to personal characteristics

Consumers' **need for more knowledge on healthy eating** and a **need for cognition** provides opportunities for personalisation of the format of nutrition advice. These consumers can best be provided with:

- More information on their own **health status** and **current dietary pattern**
- More **level of detail** of the provided information on diet and health and a higher **frequency** with which information is provided



# Personalising the design of PNH services can also be done based on personality dimensions that can be derived from the different personal characteristics

- Consumers' **sense of insecurity**:
  - Give advice in push format and less detailed forms of advice for consumers who are more insecure
- Consumers' **intrinsic interest and capability** to eat healthy:
  - Give more detailed forms of advice for consumers who have a stronger intrinsic interest and capability to eat healthy
- Consumers' need to **seek positive challenges**:
  - Frame advice in terms of positive consequences (promotion focus) for consumers who seek more positive challenges

# Results



# Part I – Ways to deliver feedback and advice

- **Communication channel:** a digital platform is preferred (i.e., website, email or smartphone-app) above other forms of service (e.g. in person)
- **Push/pull:** 66% want to look up the advice themselves whenever; 23% want reminders at self-determined times
- **Timing:** Messages in the morning are preferred: majority chooses 'when getting up', followed by 'in the morning'
- **Frequency:** Daily and weekly advices are preferred;
  - Daily (33%);
  - Weekly (22%);
  - Several per week (16%);
  - Multiple per day (13%);
  - Once in total (4%)
- **Location:** Most people (89%) want to receive the advice at home.

# Part I – Ways to design the advice

- **Preferred execution:** 52% want to start changing their dietary pattern by focusing on a single meal moment; 22% want to change everything at once; 19% want to start changing/replacing one product
- **Execution/advice options:** respondents mainly want general advice on healthy dietary patterns, suggestions for healthy alternatives and recipes that are based on their personal health & preferences
- **Tone of advice:** Almost half of the respondents (43%) prefers a neutral tone of advice, followed by a motivating/coaching tone (33%). A directive tone is least preferred (24%).
- **Framing of advice:** The majority chooses for promotion focus, i.e. how one can achieve positive results (87%) instead of prevention focus, i.e. to avoid negative effects (13%).
- **Information density:** brief advice is preferred; almost half of the participants wants brief advice.

# Part I – Ways to receive feedback

- **58% want feedback on their health status** of which the majority prefers a score with explanation of what this score means
- **62% want feedback on their dietary pattern** of which the majority prefers a score with explanation of what this score means (33%) or a score relative to the guidelines including an explanation of the score (22%)
- Both for the scores on health status and on dietary pattern, a combination of text and graph is the preferred way of displaying the information

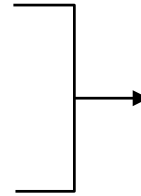
# Implications Part I - Tips to design PHN services

- **A digital service platform** that is available at anytime and anywhere
- Formulate advice in positive terms (promotion focus)
- **Opportunities for personalisation:**
  - Type of feedback: (1) health status; (2) dietary pattern; (3) both; (4) none
  - Ask consumers about their preferred style when onboarding the service
  - Let consumers choose their preferred change strategy (e.g., gradually: first start with one meal moment)
- **Desirable functionalities** of the platform:
  - Option to flexibly configure and set reminders
  - Layered approach for information density
    - Start with brief information with option to read more
  - Personal recipes and healthy alternatives as extra advice options

## Part II - The most predictive personal characteristics for different formats of advice

Particularly consumers' **need for more knowledge\*** on how to eat healthy affects several preferences for certain formats of advice. Consumers with a higher need for knowledge are more likely to choose to receive:

- 1) information on their **health status**
- 2) information on their **diet**
- 3) more **detail** in their personalised nutrition advice
- 4) a higher **frequency** of advice (>1 a day)



Probability for these choices can potentially increase from 30% to 60-75%

\* Similar effects are found for the personal characteristic need for cognition (i.e., extent to which consumers are inclined to engage in cognitive activities)

## Part II - Other predictive personal characteristics of consumers for certain formats of advice

- The lower consumers' **self-efficacy** is (i.e. more difficulty to maintain a healthy diet), the more likely consumers:
  - 1) choose either a **motivating or directive tone of advice** instead of a more neutral/factual tone.
  - 2) prefer advice in '**push format**' (getting advice on a fixed moment) instead of advice in 'pull format' (deciding for yourself when to look up advice).
- Consumers with a higher **need for affect** (i.e., extent to which consumers approach emotion-inducing situations) are more likely to choose a **motivating tone of advice** (over a more neutral/factual tone).



# Implications Part II - Design tips based on consumer characteristics

- Provide users who have a **high need for more knowledge on healthy eating** and a **high need for cognition** with:
  - More information on their health status
  - More information on their current dietary pattern
  - More detailed information
  - Frequent provision of advice (>1 a day)
  
- **More opportunities for personalisation:**
  - Tone of advice: motivating/coaching tone is preferred for consumers with a **low self-efficacy** to maintain a healthy diet and consumers with a **high need for affect**
  - Push vs. pull: push format (getting advice on a fixed moment) is preferred for consumers with a **low self-efficacy** to maintain a healthy diet

# Part III – Four factors can be identified based on the different consumer characteristics



## Factor 1: **Intrinsic interest & capability to eat healthy**

- an intrinsic interest in healthy eating, and the will (and capability) to stick to a healthy diet.



## Factor 2: **Experienced difficulties in maintaining a healthy diet**



## Factor 3: **General (self-worth) insecurity**

- a general attitude which points to 'insecurity' in the form of avoiding emotions and looking to others to judge one's behaviour



## Factor 4: **Seeking positive challenges**

- seeking positive results and the experience of emotions

These factors are an indication which consumer characteristics fit together and measure more **general, higher-order personality dimensions**.

# Part III – Design of PNH advice different per factor



Factor 1: Intrinsic interest & capability to eat healthy

- The greater a consumer's **intrinsic interest and capability** is to eat healthy, the stronger the preference is for more **detailed advice**



Factor 2: Experienced difficulties in maintaining a healthy diet

- The more difficult a consumer finds it to eat healthy (**low self-efficacy**), the stronger the preference is for advice in **push format**



Factor 3: General (self-worth) insecurity

- Consumers with a stronger sense of insecurity, are less likely to prefer more **detailed advice**
- The stronger one's insecurity is, the stronger the preference is for advice in **push format**



Factor 4: Seeking positive challenges

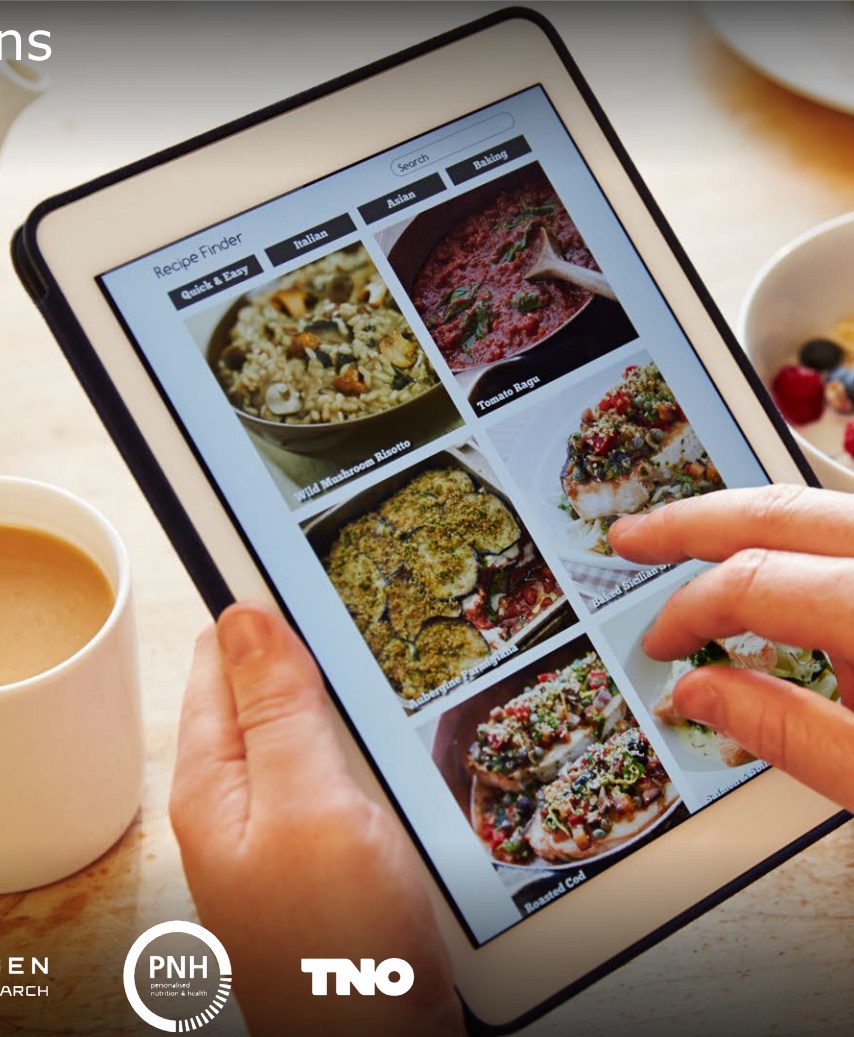
- The more a consumer is **seeking positive challenges**, the less likely a format advice framed in terms of **prevention focus** (avoiding negative consequences) is preferred

# Implications Part III - Design tips based on personality dimensions

Personalise the format based on:

- Consumers' **intrinsic interest and capability** to eat healthy:
  - Adapt the degree of detail of advice to interest and capability
- Consumers' **experienced difficulties in maintaining a healthy diet** and **sense of insecurity**
  - Develop less detailed forms of advice that can be used in push format
- Consumers' need to **seek positive challenges**:
  - Consumers who seek more positive challenges, are less likely to prefer advice framed in terms of prevention focus (avoid negative consequences): frame advice in terms of positive consequences (promotion focus)

# Conclusions



# Need for digital platform consumers can tailor themselves

- Some general preferences in relation to different feedback and advice formats can be distinguished. For example, a **digital platform** is preferred (i.e., website, email or smartphone app), in which consumers can look up the advice themselves (**i.e., pull**).
- On other aspects of feedback/advice formats, preferences are more divided among consumers. For example, the tone of the advice and the **information density** of the advice.
- More importantly, although sometimes a majority prefers a certain format of feedback/advice, there is still a large group that prefers another option. For example, a small majority wants to start changing their dietary pattern of **one meal moment**, but about a quarter of the people want to change their whole dietary pattern at once.
- This study shows that it is possible to use personal characteristics to understand and predict the way consumers would like to receive feedback and advice about their diet.
- The study also shows that there are different consumer personalities that may benefit by being addressed according to their preference for receiving feedback and advice on specific moments, of a specific level of detail and highlighting the type of consequences the advice has.

# Ideas for further research

New insights are obtained into what the design of personalised feedback and advice should look like. Based on this, several ideas for further research can be provided.

- It would be interesting to compare the effectiveness and evaluation of preselecting a format of advice based on personal characteristics with the effectiveness and evaluation when consumers can choose their own desired format.
- Similarly, further research could examine whether the preferred format of advice changes over time.

# Ideas for further research

New insights are gained on the inclusion of personal characteristics in personalised advice. This has scientific implications.

- There are several options for personalising nutrition advice: using specific personal characteristics (Part II) or using more higher-order personality dimensions (Part III). Which method to personalise advice is preferable, in terms of impact and applicability in practice?
- Based on the four factors presented in this study a reduction of questionnaire items may be achieved. Of course this basically means the construction of a new psychological scale, specifically focused on 'food and health'-related psychological characteristics. Such a scale will need to be studied and analysed in detail before it can validly be applied in subsequent studies in this field.
- A next step is to (experimentally) test whether the suggested personalisation method, either based on specific personal characteristics or more higher-order personality dimensions, will lead to a higher compliance of the advice by users.
- Focus within the current study was on differences between individuals. A recent paper argues that the inter-individual differences that separate most people are smaller and less important than the day-to-day variance within each of us (Betts & Gonzalez, 2016). This suggests that how an individual changes during the day (e.g. with every consumption moment) might be more important than the differences between individuals. Thus, it is interesting to gain insight into whether personalised nutrition advice should focus on inter-individual differences or on intra-individual differences and for which socio-demographic variables this is the case.



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# Appendix I: Detailed results

Part I: Preferences design of the PN&H advice

Part II: Personal characteristics in relation to preferences for PNH service design

Part III: Identifying dimensions of personal characteristics with factor model

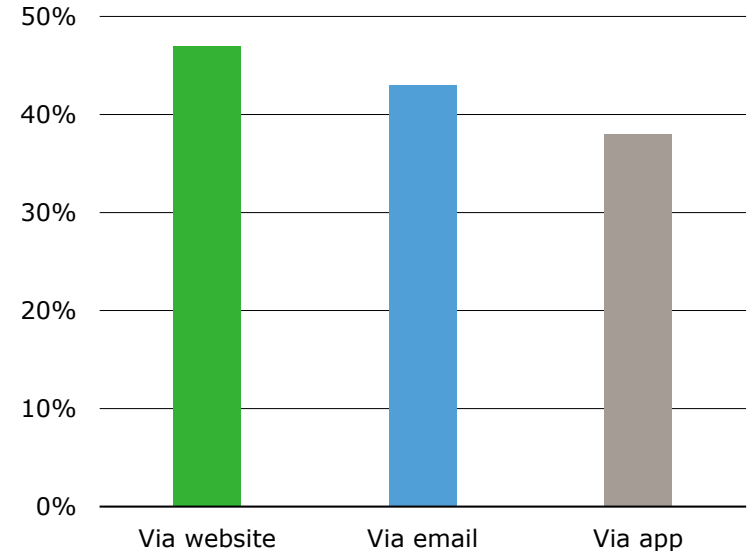
# Detailed results Part I: Preferences design of the PN&H advice

# What is your preferred method for receiving personalised dietary advice?

Options presented (multiple answers were possible)	% yes*
Via website	47%
Via email	43%
Via app on your smartphone	38%
On paper, sent by mail (folder/flyer/report)	24%
Via personal consultation on location	19%
Via personal consultation at home	12%
Via online chat, for direct contact	11%
Via personal consultation over the phone	5%

\* Percentage of participants who said yes to each option

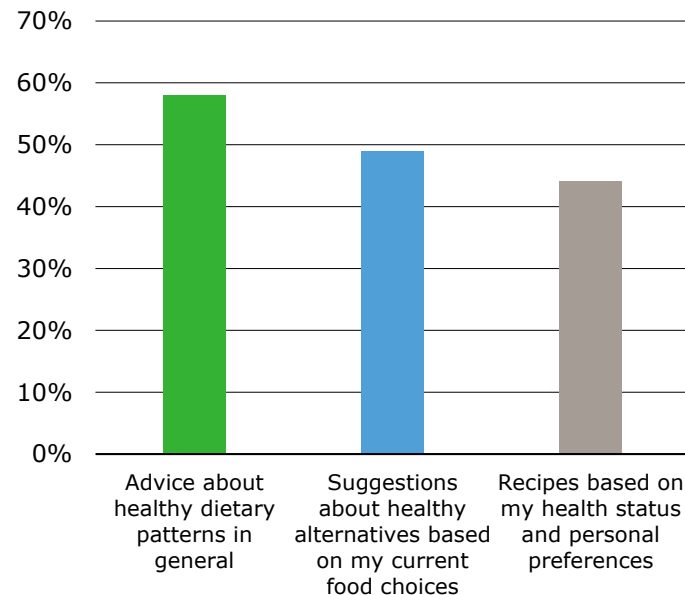
### Preferred medium for PN advice



# What type of personalised digital dietary advice would you prefer?

Type of personalised digital dietary (multiple answers were possible)	%
Advice about healthy dietary patterns in general	58%
Suggestions about healthy alternatives based on current food choices	49%
Recipes based on my health status and personal preferences	44%
Feedback about what I should/ shouldn't do with regard to my food choices	37%
A personalised shopping list with products that fit a healthy food pattern for myself	29%
Tips on how I can best adhere to my personalised food choice advice	25%
Notifications with food choices suggestions at my preferred times and locations	17%
A personalised mealbox with meals that fit a healthy food pattern	15%
Additional personal support regarding changing my personal diet	12%
Other:	7%

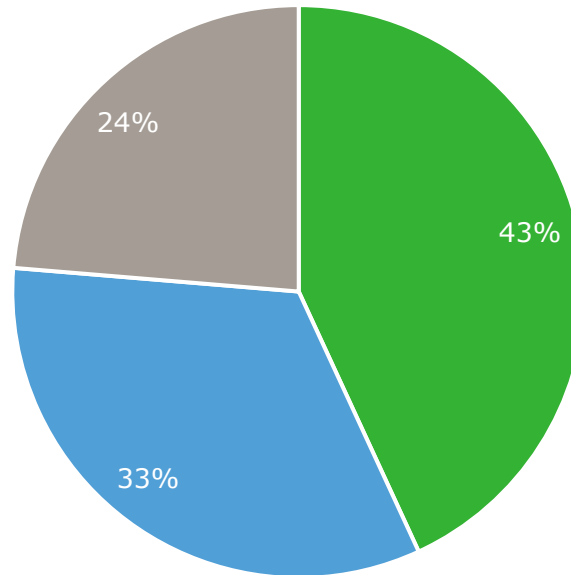
Types of preferred digital dietary advice  
(top 3)



# Communication style or tone of dietary advice

If you were able to receive personalised dietary advice, which communication style would you prefer?

Communication style of dietary advice

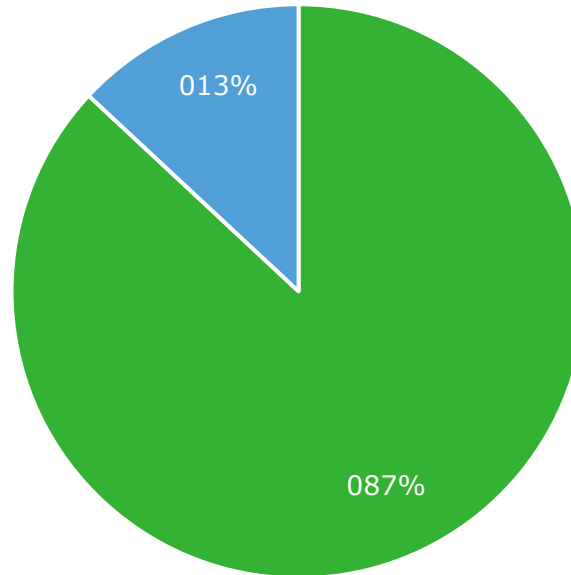


- Neutral/factual (e.g., "You have now consumed 80% of your recommended daily amount of protein")
- Motivating/coaching (e.g., "You only need an additional 20% of protein to achieve your daily target")
- Directive (e.g., "Select an egg instead of ham as sandwich topping")

# Promotion/prevention focus of dietary advice (“framing”)

If you were able to receive personalised dietary advice, what would be your preferred focus of this advice?

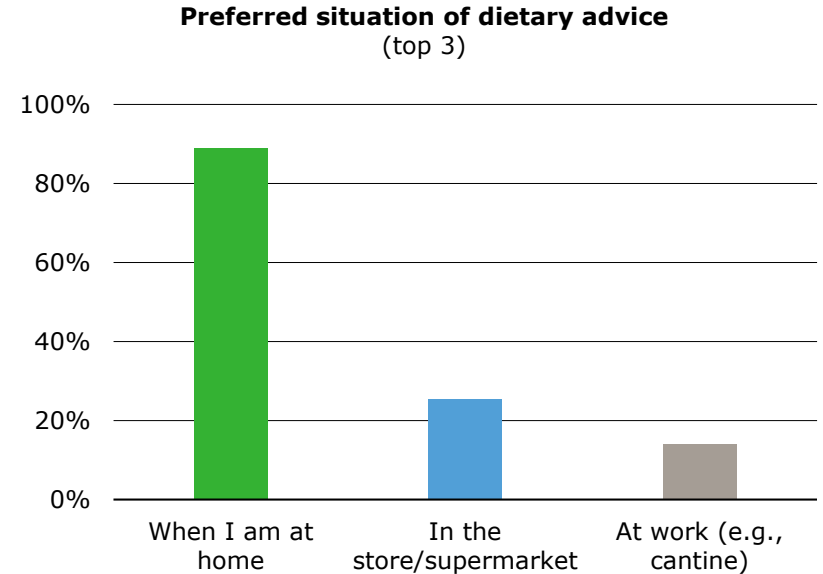
**Promotion/prevention focus of dietary advice**



- Information on how to achieve positive results (e.g., "Select soup together with your sandwich to lose weight")
- Information on how to avoid negative consequences (e.g., "Avoid snacks in order to not gain weight")

# If you were able to receive personalised dietary advice, where would you like to receive this advice?

Where would you like to receive this advice (multiple answers were possible)	%
When I am at home	89%
In the store/supermarket	25.5%
At work (e.g., canteen)	14%
In a restaurant	12.5%
In the gym/health centre	10%
At a party/birthday/reception	6%
Other:	6%



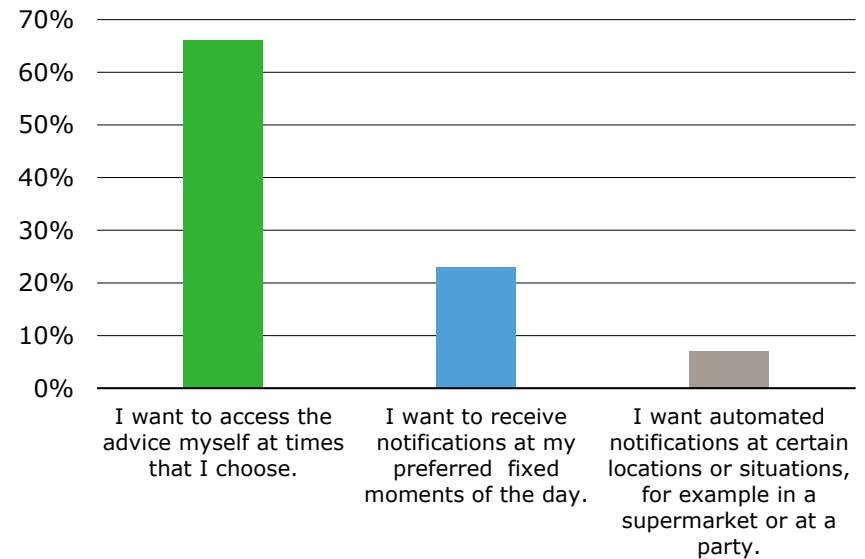


# Push or pull of personalised dietary advice

Push or pull of personalised dietary advice	%
I want to access the advice myself at times that I choose.	66%
I want to receive notifications at my preferred fixed moments of the day.	23%
I want automated notifications at certain locations or situations, for example in a supermarket or at a party.	7%
Other:*)	4%

\*) Most frequent reply: "never"

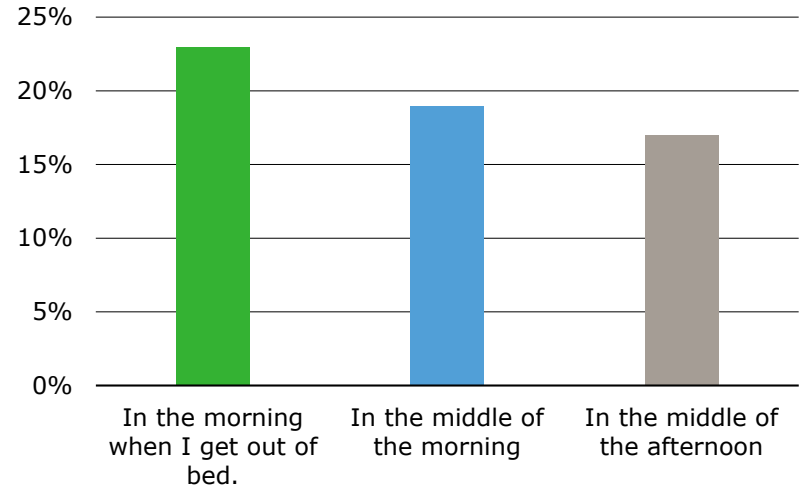
**If you would be able to get personalized dietary advice, what is the preferred way of receiving this?**



# Moment of personalised dietary advice

If you were able to receive personalised dietary advice, what would be your preferred moment?	%
In the morning when I get out of bed	23%
In the middle of the morning	19%
In the middle of the afternoon	17%
Around dinnertime	10%
In the evening when I go to bed	9%
During breakfast	7%
During lunch	6%
Other:*)	9%

**Moment of dietary advice**  
(top 3)

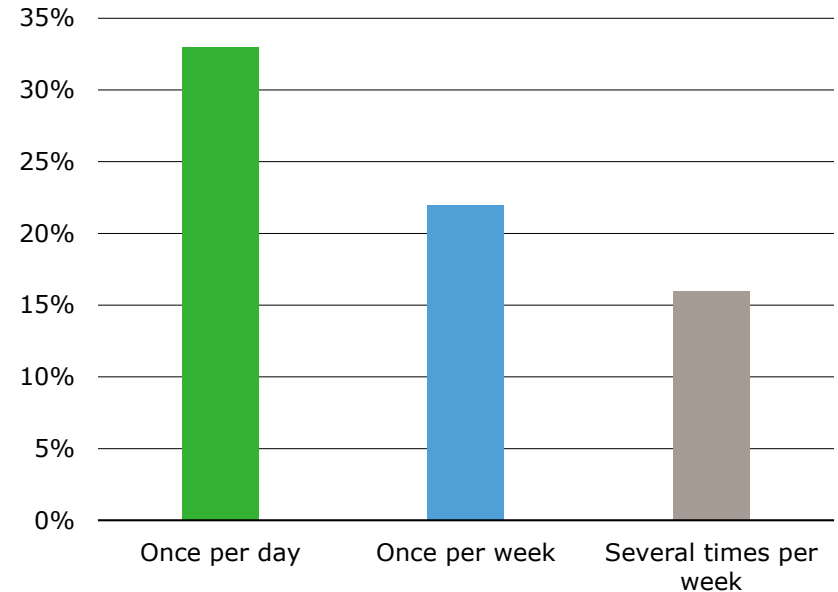


\*) most frequent response: "no preference"

# Frequency of personalised dietary advice

If you were able to receive personalised dietary advice, what would be your preferred frequency?	%
Once per day	33%
Once per week	22%
Several times per week	16%
Several times per day	13%
Once only	4%
Every other week	3%
Once per month	3%
Less than once per month	2%
Other:*)	4%

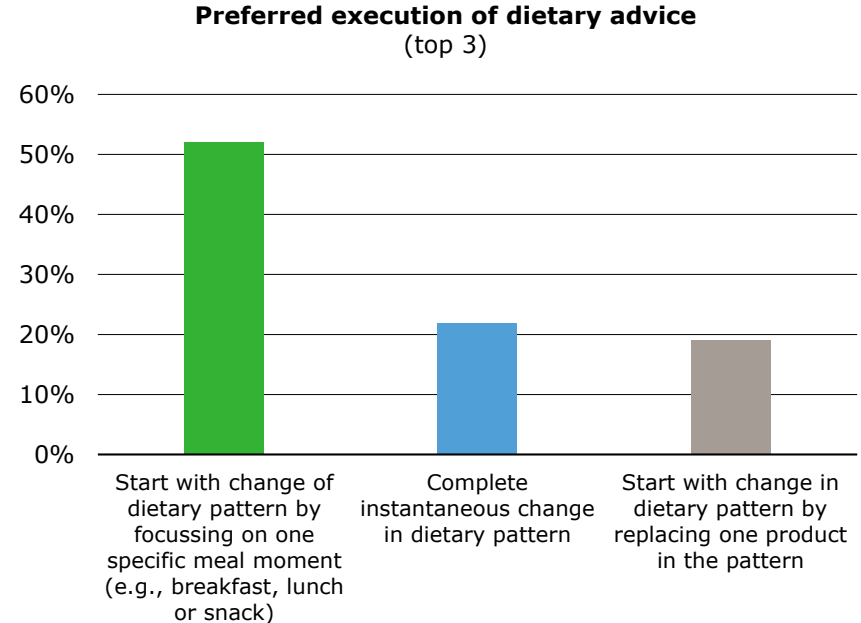
Frequency of dietary advice  
(top 3)



\*) Most frequent response: "never"

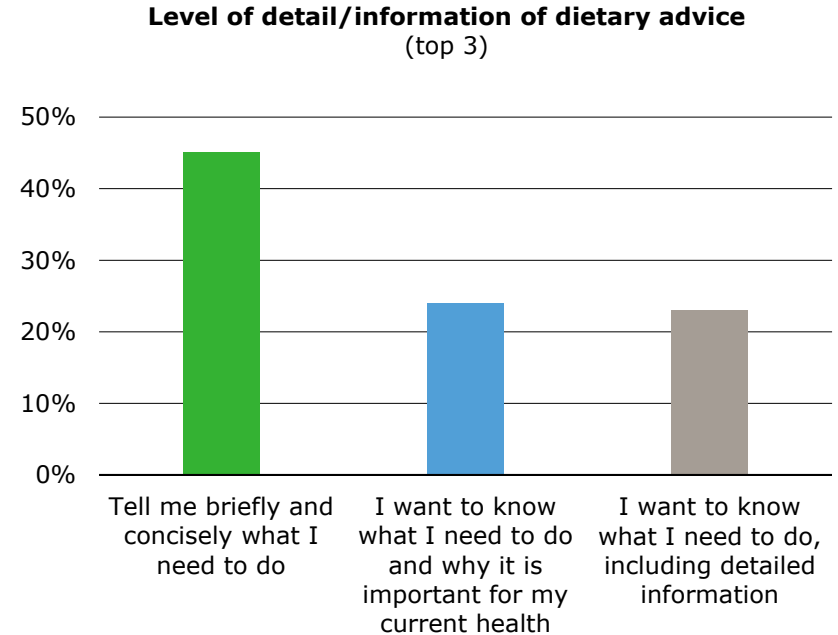
# Preferred execution of personalised dietary advice

Preferred execution of personalised dietary advice	%
Start with change of dietary pattern focussing on one specific meal moment (e.g., breakfast, lunch or snack)	52%
Complete instantaneous change in dietary pattern	22%
Start with change in dietary pattern by replacing one product in the pattern	19%
Start with change in dietary pattern by focussing on one specific situation (e.g., parties, work or restaurant)	8%



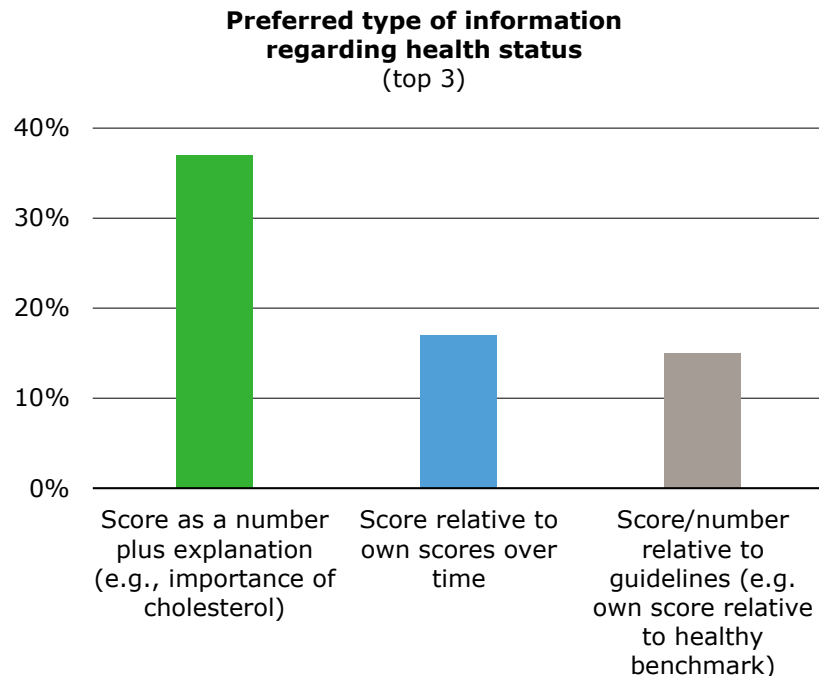
# Level of detail/information of dietary advice

If you were able to receive personalised dietary advice, what would be your preferred level of explanation?	%
Just tell me briefly and concisely what I need to do	45%
I want to know what I need to do and why it is important for my current health	24%
I want to know what I need to do, including detailed information	23%
I want to know what I need to do to avoid future health problems	8%



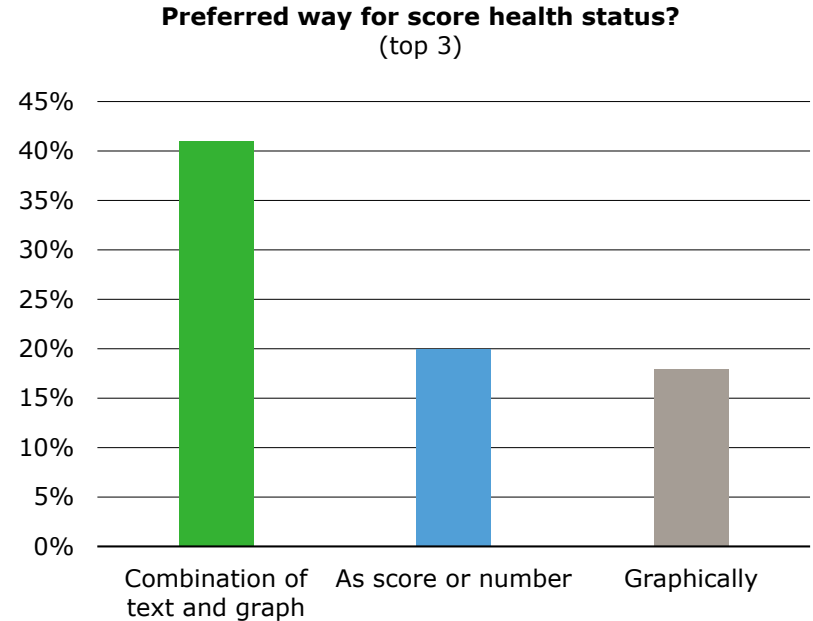
# Need for and level of feedback on health status

Need for feedback:	%
Yes	58%
No	42%
<b>Preferred type of information on health status:</b>	
Score as number + explanation (e.g., why cholesterol?)	37%
Score relative to own scores over time	17%
Score/number relative to guidelines (e.g., own score relative to healthy benchmark)	15%
Score relative to norm (average score of population)	15%
Score as a number	13%
Score relative to family, friends and co-workers	1%
Other:	2%



# Need for and level of feedback on health status (2)

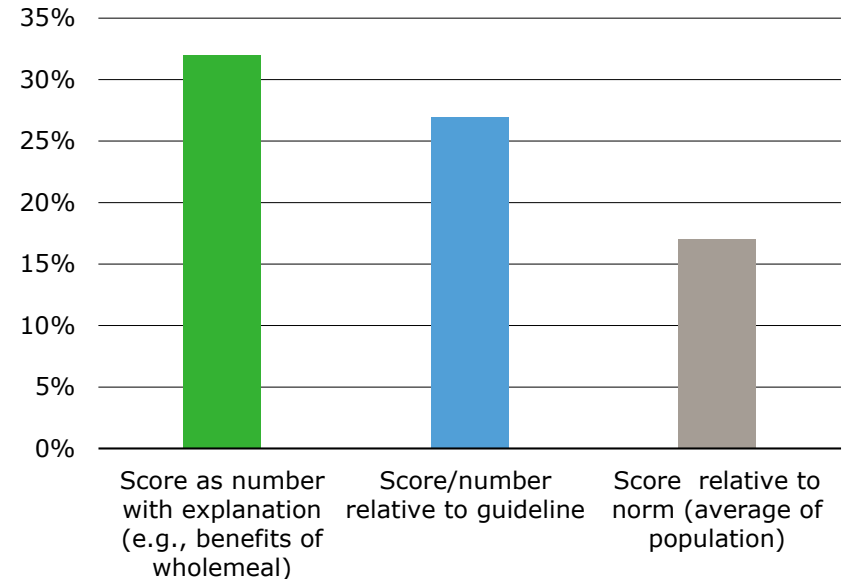
How would you like your health status score to be displayed?	%
Combination of text and graph	41%
As score or number	20%
Graphically	18%
As text	15%
Other:	



# Preferred additional information on your current dietary patterns?

In addition to your personalised dietary advice, would you like to receive additional information on your dietary patterns?	%
Yes	66%
No	34%
<b>I would prefer to receive information on my current dietary pattern via:</b>	
Score as number with explanation	32%
Score/number relative to guideline	27%
Score relative to norm (average of population)	17%
Score as number	13%
Relative to own score over time	9%
Score relative to family, friends and co-workers	1%
Other:	1%

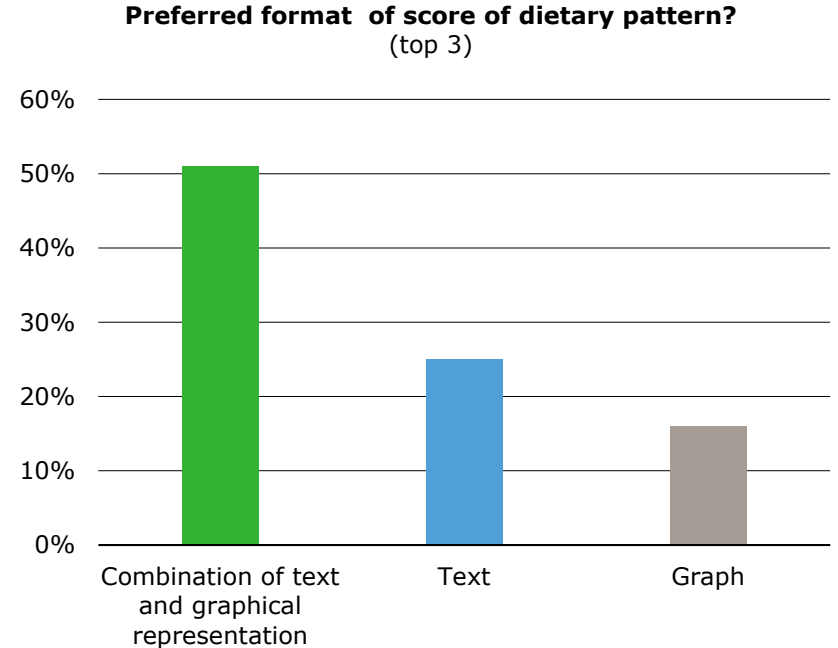
**Preferred information of my current dietary pattern (2)**





# What format do you prefer for your dietary pattern score?

What format do you prefer for your dietary pattern score?	%
Combination of text and graphical representation	51%
Text	25%
Graph	16%
Graphical representation	9%
Other:	1%



# Detailed results Part II: Personal characteristics in relation to preferences for PNH service design

# Overview preferences for aspects of PNH service design that significantly relate to personal characteristics (1)

Personal characteristic	Preferences for PNH service design	Effect ( $p < .05$ )
<b>Self-efficacy</b>	Preference for push vs pull format	Probability that advice in “push format” (you receive advice at a fixed moment) is chosen increases the more difficult consumers find it to maintain a healthy diet (lower self-efficacy).
	Preferred tone of advice	The more difficult consumers find it to maintain a healthy diet (lower self-efficacy), the more likely it is that they will choose a <i>motivating</i> or <i>directive</i> tone of advice, as opposed to a <i>neutral/factual</i> tone of advice.
	Preferred execution of personalised dietary advice	Consumers who find it more difficult to maintain a healthy diet (lower self-efficacy) will be less likely to prefer to change their whole diet at once, rather than changing diet on one eating occasion. <i>NB. this effect is only marginally significant (<math>p = .063</math>).</i>
<b>Self-regulation</b>	Preferred execution of personalised dietary advice	Consumers with a high level of self-regulation are more likely to prefer to change their whole diet at once, instead of changing diet on one eating occasion, but also by changing one product or changing diet in one situation (e.g., at parties).

# Overview preferences for aspects of PNH service design that significantly relate to personal characteristics (2)

Personal characteristic	Preferences for PNH service design	Effect ( $p < .05$ )
<b>Need for cognition</b>	Preference level of detail advice	Consumers with a higher need for cognition are more likely to choose more detailed forms of information when receiving personalized nutrition advice
	Need for feedback on health status	The greater the need for cognition, the higher the probability that consumers will choose the option to receive information on their own health status.
	Choice for information on diet	The greater the need for cognition, the higher the probability that consumers will choose the option to receive information on their own diet.
<b>Need for affect</b>	Preferred tone of advice	Consumers with a higher need for affect (i.e., extent to which consumers approach emotion-inducing situations) are more likely to choose a motivating tone of advice over a neutral tone.

# Overview preferences for aspects of PNH service design that significantly relate to personal characteristics (3)

Personal characteristic	Preferences for PNH service design	Effect ( $p < .05$ )
<b>Need for knowledge on healthy eating</b>	Preference level of detail advice	Consumers who want to obtain more knowledge on healthy eating are more likely to choose more detailed forms of information when receiving personalised nutrition advice.
	Preferred frequency of advice	Consumers with a higher need for more knowledge are less likely to choose a lower level frequency of advice (< 1 day) rather than a high frequency of > 1 a day.
	Need for feedback on health status	The greater the need for knowledge on healthy eating, the higher the probability that consumers will choose the option to receive information on their own health status.
	Choice for information on diet	The greater the need for knowledge on healthy eating, the higher the probability that consumers will choose the option to receive information on their own diet.

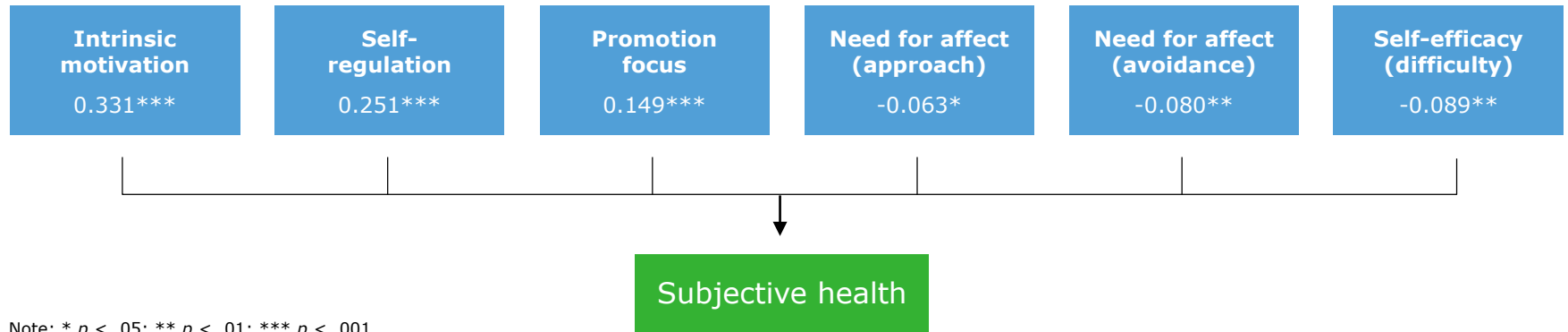
# Personal characteristics that do not affect consumer preferences

- Whether consumers prefer advice on how to gain positive results (**promotion focus of advice**), as opposed to advice on preventing negative results (**prevention focus**) is not related to consumers' level of **promotion focus or prevention focus as a personal characteristic** (i.e., whether consumers structurally tend to focus on gaining positive outcomes, or preventing negative outcomes).
- Whether consumers prefer advice in **push format** (receiving advice at a fixed moment) or **pull format** (decide for yourself when to look up advice) and the preferred **tone of the advice** (neutral/factual, motivating or directive) are not related to consumers' level of **self-regulation**.
- How often consumers want to receive advice (**frequency**) is not related to consumers' level of need for cognition (i.e., consumers with a higher **need for cognition** do not show a stronger preference for receiving advice more often).

# Relation between personal characteristics and subjective health

How healthy consumers view themselves to be (subjective health) depends on several personal characteristics:

- The more intrinsically motivated consumers are, and the higher their level of self-regulation and promotion focus, the healthier consumers view themselves to be.
- The more consumers seek to experience emotions and avoid emotions and the more difficult consumers find it to maintain a healthy diet, the less healthy consumers view themselves to be.

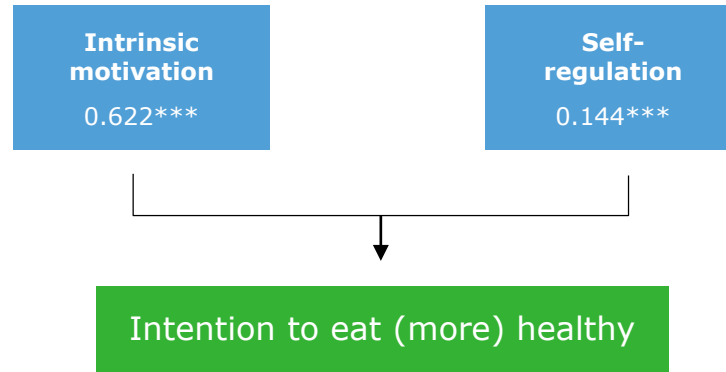


Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

# Relation between personal characteristics and intention to eat (more) healthy

The degree to which consumers intend to eat healthy depends on several personal characteristics:

- The more intrinsically motivated consumers are, and the higher their level of self-regulation, the more consumers intend to eat healthy.



Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$



# Detailed results Part III: Identifying dimensions of personal characteristics with factor model

# Results factor model (1)

The factor analysis (i.e., principal components analysis, PCA) revealed four factors

- Factor 1: Intrinsic interest & capabilities for eating healthy (18% VAF (= variance accounted for))
  - Comprising items from the following psychological measurement scales
    - Intrinsic motivation healthy eating
    - Self-efficacy healthy eating
    - Information processing healthy eating
    - Self-regulation healthy eating
  - The first dimension shows an intrinsic interest in healthy eating, and the will (and propensity) to stick to a healthy diet.
- Factor 2: Healthy diet difficult (13% VAF)
  - Comprising all self-efficacy healthy diet items
    - Note that this shows it is not self-efficacy healthy eating (Factor 1)
    - All items negatively framed ('It is difficult to keep to a healthy diet when...')
  - The second dimension contains all items stating a difficulty in maintaining a healthy diet, under a broad range of circumstances. This could be due to the fact that the items are negative framed. This may have prompted similar answers, or prompted the subjects to answer all these items in a similar way.

# Results factor model (2)

- Factor 3: General insecurity (12% VAF)
  - Comprise items from general psychological measurement scales, not food specific scales
  - The third dimension shows a general attitude which we describe as 'insecurity'. All items loading on this dimension point to a personality that compares his/her behaviour to others, in order to judge his/her own behaviour. The person is afraid to make mistakes. In addition strong emotions are avoided for fear of being overwhelmed or unable to handle them.
  
- Factor 4: Seeking challenges (8% VAF)
  - Comprise items from general psychological measurement scales, not food specific scales
  - The fourth dimension appears to point to the type of individual who enjoys a challenge, and uses emotions as a guide.

# Using factors in prediction: Promotion/ prevention focus of dietary advice (“framing”)

*If you were able to receive personalised dietary advice, what would be your preferred focus of this advice?*

1. Information on how to achieve positive results (e.g., "Select soup together with your sandwich to lose weight")
2. Information on how to avoid negative consequences (e.g., "Avoid snacks in order to not gain weight")

	B	S.E.	Wald	df	Sig.	Exp(B)	C.I.for	
							Lower	Upper
Eating healthily	-0.139	0.094	2.156	1	0.142	0.870	0.723	1.048
Healthy diet difficult	-0.140	0.096	2.131	1	0.144	0.869	0.720	1.049
General insecurity	0.170	0.098	3.014	1	0.083	1.185	0.978	1.436
Seeking challenges	-0.223	0.096	5.408	1	0.020	<b>0.800</b>	0.663	0.966
Constant	-1.939	0.098	391.357	1	0.000	0.144		

## Explanation:

- The regressions show a significant effect only for the 4th factor, with an odds ratio of 0.8. An increase of the score on the 4<sup>th</sup> factor results in a lowering of the probability of preferring option 2 (avoid negative consequences).
- This makes sense as the 4th factor contains a promotion focus.

# Using factors in prediction: Preference for receiving information (push or pull)

*If you were able to receive personalised dietary advice, how would you prefer to receive this?*

1. I want to access the advice myself at times that I choose (pull)
2. I want to receive notifications at my preferred fixed moments of the day (push)

	B	S.E.	Wald	df	Sig.	Exp(B)	C.I. for	
							Lower	Upper
Eating healthily	0.017	0.080	0.045	1	0.832	1.017	0.869	1.191
Healthy diet difficult	0.164	0.081	4.111	1	0.043	<b>1.178</b>	1.005	1.380
General insecurity	0.302	0.080	14.240	1	0.000	<b>1.353</b>	1.156	1.582
Seeking challenges	0.032	0.080	0.164	1	0.685	1.033	0.883	1.209
Constant	-1.072	0.078	186.478	1	0.000	0.342		

## Explanation:

- We find significant results for the 2nd and 3rd factor. A higher score on factor 2 results in a heightened (1.18) probability for the preference to receive 'push' information (score 2).
  - Lower dietary self-efficacy (finding it difficult) leads to a greater preference for receiving 'push' information
- The same is true for a higher score on factor 3 with an odds ratio of 1.36.
  - Higher insecurity (social comparison, avoid emotions, prevention focus) leads to a preference for receiving 'push' information

# Using factors in prediction: Preferred level of detail

*If you were able to receive personalised dietary advice, what would be your preferred level of explanation?*

1. Just tell me briefly and concisely what I need to do
  2. I want to know what I need to do, including detailed information
  3. I want to know what I need to do and why it is important for my current health
- RECODED in prediction: 2 and 3 taken together.

	B	S.E.	Wald	df	Sig.	Exp(B)	C.I.for	
							Lower	Upper
Eating healthily	0.196	0.069	8.070	1	0.005	1.217	1.063	1.394
Healthy diet difficult	0.102	0.068	2.233	1	0.135	1.107	0.969	1.266
General insecurity	0.323	0.069	22.027	1	0.000	1.381	1.207	1.581
Seeking challenges	-0.014	0.068	0.040	1	0.841	0.986	0.863	1.128
Constant	0.064	0.068	0.889	1	0.346	1.066		

## Explanation: Two significant factors, 1st and 3rd.

- High score on factor 1 has 1.2 times higher chance of preferring detailed information.
  - Healthy eaters (motivated, self-efficacy, self-control, information processing) prefer detailed information
- High score on factor 3 has 1.4 times higher chance of preferring detailed information.
  - Higher insecurity (e.g., comparing with others), leads to preference for detailed information

# Appendix II: Methodology

# Questionnaire development

- Online questionnaire for quantitative study among consumers in the Netherlands.
  - Field work conducted by market research agency (MSI-ACI Europe BV). Participants were sampled from its consumer panels and asked by e-mail to fill out an online self-administered questionnaire
  - Fieldwork carried out in August-September 2018
  - The questionnaire items were in Dutch
  - To ensure a nationally representative sample, participants were quota-sampled based on gender, age, highest level of completed education and income
- Questionnaire consisted of two parts:
  - Personal characteristics
  - Preferences for different formats of personalised advice (i.e., preferred method, communication style, frequency and moment of advice, type of information, level of detail and layout preferences)



# Sample characteristics

## The final study sample consists of 988 respondents

	#	%
<b>Gender</b>		
Male	486	49.3
Female	500	50.7
<b>Age</b>		
18-24	116	11.7
25-34	166	16.8
35-49	275	27.8
50-64	285	28.8
65+	146	14.8
<b>Education level</b>		
Low	187	18.9
Medium	452	45.7
High	349	35.3
<b>Household size</b>		
Single	254	25.7
Two persons	384	38.9
Three or more persons	350	35.4

	#	%
<b>Income level (net monthly income)</b>		
< €1,500	142	14.4
€1,500-€3,000	381	38.6
€3,000-€7,500	257	26.0
> €7,500	22	2.2
Would rather not say/ Don't know	186	18.8
<b>Diet-related health problem</b>		
Yes (e.g., overweight, diabetes, high blood pressure, cholesterol, gastrointestinal problems)	456	46.2
No	532	53.8
<b>Office worker</b>		
Yes	328	33.2
No	660	66.8

# Data analyses

## Part I: Preferences format of PN&H advice

- Data were analysed with descriptive statistics (frequencies were calculated).

## Part II: Personal characteristics in relation to format preferences

- Data analyses were conducted in 2 steps:
- Relation single personal characteristics and preference for certain formats of personalised advice (Part II)
  - Binomial logistic regression – 2 format options available for personalised advice (e.g., advice via push or pull messages)
  - Multinomial logistic regression – 3 or more format options available for personalised advice (e.g., neutral, motivating or directive tone of advice)
- Principal Component Analysis (Part III)
  - Identifying underlying structure in respondents' personality types
  - (logistic) regression using the obtained PCA structure to predict feedback preferences

# Data analyses

## Part III: Identifying dimensions of personal characteristics using factor model

- Principal Component Analysis
  - PCA with Varimax in 4 dimensions
  - (logistic) regressions using the obtained PCA factors predicting some preferred formats of the advice
- 4 Factor model (51% Variance Accounted For)
  - Eating healthily (18% VAF)
  - Healthy diet difficult (13% VAF)
  - General insecurity (12% VAF)
  - Seeking challenges (8% VAF)

# More information

## **Dr. Machiel Reinders**

Senior scientist Consumer Behaviour and Marketing  
Wageningen University & Research

[machiel.reinders@wur.nl](mailto:machiel.reinders@wur.nl)

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