
Formative research on HAPA model determinants for fruit and vegetable intake: target beliefs for audiences at different stages of change

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Abstract

Theoretically driven health communications are needed to promote fruit and vegetable intake among people at different stages of change. The Health Action Process Approach, a clearly specified model and good predictor of fruit and vegetable intake, was used as a framework to guide a formative research for the development of health messages targeting individuals at either a non-intentional or intentional stage of change. A mixed-method approach was used, combining eight focus groups ($n = 45$) and a questionnaire ($n = 390$). Target beliefs for people at both stages were identified under five theoretical constructs (risk perception, outcome expectancies, action planning, coping planning and self-efficacy). Highlighting health problems due to low fruit and vegetable consumption, health benefits, weight reduction and pleasure and enhancing self-efficacy to increase fruit and vegetable intake are the main guidelines for designing messages to non-intenders. For intenders, messages should reassure them of their ability to maintain adequate fruit and vegetable consumption, outline specific plans for increased consumption, identify barriers such as preparation, forgetting or being tired and unwilling to eat fruits and vegetables and suggest strategies to overcome them, such as presenting some practical examples on how to include fruits and vegetables when eating out.

Introduction

Epidemiological evidence supports the crucial role of nutrients present in fruits and vegetables (FV) for the prevention of major diseases such as cancer [1, 2], cardiovascular diseases [3, 4] and its association with lower weight and lower body mass [5, 6] has suggested increase in FV intake is a way of minimizing the obesity pandemic [7]. However, many adults do not eat the recommended amount of FV (i.e. 400 g a day) and thus, the increase of FV intake among that layer of the population constitutes a major public health goal [8].

The launch of health campaigns is a common type of intervention for public health purposes [9, 10] and studies have revealed positive effects of this type of intervention for FV consumption [11, 12]. This type of intervention might be especially suited to adult populations as they are responsible for their own dietary choices, unlike most adolescents and children [13, 14]. Notwithstanding, certain communication strategies have the potential to increase health communications' effectiveness for the changing of health behaviours and, ultimately, to contribute towards improving the population's health. One of such strategies is message targeting [15], which consists of the development of health messages directed at a specific segment of the audience, increasing the change of compliance with the message recommendations by fitting the message content to the audience's interests and needs [16].

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The effectiveness of health communications also depends on whether they are theoretically driven. Studies have shown that interventions specifically targeting theoretically established beliefs are more effective in the promotion of health behaviour change [16, 17]. The determinants of health behaviours as established by social cognitive models are, therefore, essential targets for developing messages for the promotion of health behaviours such as FV intake. In particular, stage models of health behaviour change, such as the Health Action Process Approach (HAPA) [18] are an appealing template for the development of health messages, enabling the development of messages that are theoretically driven and, at the same time, relevant for people at different moments of the change process. In this study, the constructs of the HAPA model will be used to guide the search for contents to include in health messages promoting FV intake in people at different stages of change.

Health Action Process Approach

The HAPA is a clearly specified hybrid model that has been established as a good predictor of a wide range of health behaviours including FV intake [19] and that can be conceptualized as a stage model, mainly for intervention purposes [20]. Health behaviour change is considered a sequence of motivational processes leading to intention formation which are then followed by volitional processes that operate between intention formation and behaviour enactment, thus, helping to fill in the intention-behaviour gap [18]. The volitional phase may be divided into a pre-action and an action phase and, thus, three stages of change may be defined: non-intentional stage (i.e. preceding intention formation), intentional stage (i.e. after intention formation) and action stage (i.e. after behavioural enactment).

Taken as a stage model, it provides a useful framework for intervention, offering the possibility of segmenting the audience in three specific target groups, for whom particular types of messages are posited as being more effective than an undifferentiated, i.e. 'one size fits all', type of message. In

each of the stages or 'mindsets', distinct social cognitive predictors are relevant for the transition to the following stage. For those at a non-intentional stage (i.e. non-intenders), predictors leading to intention formation, such as 'risk perception', 'outcome expectancies' and 'action self-efficacy' are the most important targets for intervention [21]. 'Risk perception' pertains to perceiving oneself to be at risk of a certain health condition and might act as a trigger for starting to think about changing one's health behaviour. 'Outcome expectancies' concern the anticipation of positive rather than negative consequences resulting from the behavioural change and 'action self-efficacy' is the belief that one will be able to initiate the behavioural change.

On the other hand, those at an intentional stage (i.e. intenders) would mostly benefit from an intervention targeting the proximal predictors of behaviour (i.e. the mediators between intention and behaviour), such as 'action planning', 'coping planning' and 'maintenance self-efficacy' [18]. 'Action planning' refers to setting up when, where and how one will perform the intended behaviour and 'coping planning' encompasses anticipating barriers that might hinder the accomplishment of the intended changes, as well as strategies for dealing with such barriers. 'Maintenance self-efficacy' is vital for the initiation and maintenance of behavioural changes and refers to holding an optimistic belief about one's ability to maintain the behavioural changes.

In short, according to the model, there are theory-specified constructs that constitute relevant targets for an intervention addressing people at different stages of change. However, like other social cognitive models, the HAPA model only provides the 'skeleton' (i.e. framework) for the intervention that then has to be supplemented with 'flesh and blood' (i.e. substantive contents relevant for the particular audience) [22]. Moreover, the perspective of the health message designer is not necessarily the same as that of the message recipient and the specific motivations, barriers and self-regulatory strategies related to the adoption of the health behaviour may vary accordingly [23]. Formative research is, therefore, a crucial step towards a better understanding of the target audience and it is fundamental for

identifying the specific contents that should be included in the messages [24].

Content selection under the theoretical constructs

5 The specification of evidence-based contents under relevant theoretical constructs for health behaviour change that are important for the target audience is crucial to guide the design of health messages. However, besides eliciting a range of beliefs to give body to each of the relevant theoretical constructs for change in FV intake, it is also necessary to identify those which should be selected to figure in health messages. On this level, some authors have suggested that beliefs differentiating intenders from non-intenders and/or which best predict intentions are important targets when designing an intervention for non-intenders [25]. The rationale is that through changing such beliefs, there is a higher chance of them being translated into changes in intentions, thus, helping non-intenders to progress to an intentional stage. Applying the same reasoning, when designing an intervention for intenders, the most important targets will be those beliefs that differentiate actors from intenders and/or that best predict behaviour. Those specific beliefs are the ones that will most likely contribute towards translating intentions into behaviours, therefore leading intenders to progress to an action stage.

Aims

30 The aims of this study were to identify and prioritize beliefs under HAPA theoretical constructs that may be used for the development of health messages targeting generally healthy adults whether at a non-intentional or intentional stage of change. Through the use of qualitative methods, we first sought to identify an array of beliefs under the theoretically specified antecedents of FV intake that could serve as contents for crafting health messages. Then, whenever it was required to sort and prioritize the previously identified beliefs, owing to such a broad range of beliefs being elicited under a single construct, quantitative methods were subsequently

used. Hence, through a formative research guided by the HAPA model, we expect to support the development of health messages for the promotion of FV intake that may have an impact on theoretically established constructs, in a way that is relevant for each of the target groups.

Methods

This formative research stems from a pragmatic mixed-method approach, in which both focus groups and a questionnaire were used sequentially to answer the following research questions [26]: (i) the identification of beliefs under the HAPA constructs and (ii) the prioritization of identified beliefs. Both data collection techniques are commonly used in formative research [24]. Focus groups allow for the identification of a wide range of lay beliefs under a specific topic that would probably not emerge through other data collection techniques [27]. The use of standardized questionnaires is also important, allowing the systematic measuring of a broad array of variables and is, therefore, particularly helpful for the establishment of a hierarchy of intervention priorities for each target group, while controlling for possible confounds [24]. Therefore, the added value of this mixed-method approach was to combine information on a wide range of beliefs for each theoretical construct (elicited through the focus groups) with information on the relative importance of each belief for the target group (gathered through the questionnaire).

Identification of beliefs under the HAPA constructs (focus groups)

Participants

In total, 45 adults, 18 men (aged 20–60 years; mean = 34.5; SD = 12.6) and 27 women (aged 20–66 years; mean = 36.7; SD = 15.2), participated in the focus groups. Both to allow a certain degree of homogeneity in the groups (i.e. people in the group share a characteristic in which the researcher is interested) and a degree of heterogeneity among the groups, enabling the identification of differences in perspectives across the groups, they were

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organized in order to bring together individuals at the same stage of change regarding FV intake. A total of eight groups were formed (three groups of non-intenders, three groups of intenders and 2 groups of actors), with 4–7 participants per group. Six of the eight groups were composed of participants recruited from a professional training centre, the other two were recruited from two faculties of psychology. Focus groups occurred where the recruitment took place. None of the participants had any medical restrictions regarding FV consumption.

Measures

FV intake. Two items based on those of Luszczyńska, Tryburcy and Schwarzer [28], were used to measure FV intake, the first concerning fruit intake and the latter vegetable intake: ‘In the last two weeks you ate a (portion of fruit/vegetables)...’, and was followed by some examples of what constitutes a portion of FV. Responses ranged from 0 (‘a few times a week or less’) to 5 (‘more than four times a day’).

Stage of change. Stage of change followed the criterion of the World Health Organization of eating at least five portions of FV a day and was derived using an algorithm that comprised the answer to FV intake questions and the answer to a question evaluating participants’ intentions regarding FV intake for the following month (‘In the next month, do you intend to eat more portions of fruit/of vegetables a day? If so, how many?’) (Fig. 1).

Questioning guide. A semi-structured questioning guide that had been previously developed and pilot-tested was used to conduct the focus group sessions, and addressed all the constructs of the HAPA model of interest for this study (Table I).

Procedure

The study and its objectives were presented by the first author during a short break between classes, and those who agreed to participate completed a short questionnaire to determine their stage of change and leave their contact details for scheduling the focus group sessions.

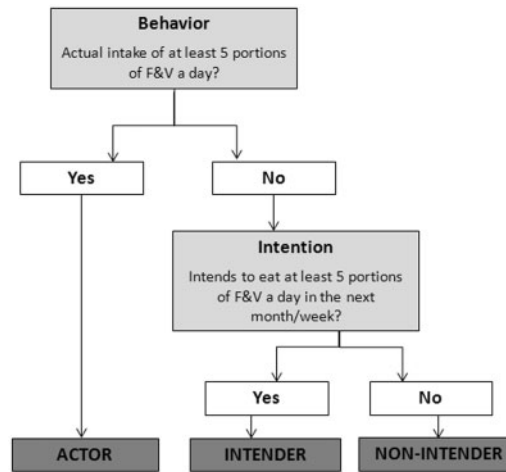


Fig. 1. Stage of change allocation according to actual behaviour and intention.

Informed consent was obtained from all participants at the beginning of the focus group session authorizing video-taping for transcription purposes. Two trained moderators were present in each session which lasted, in total, between 1 hour and 1 hour 30 min. At the end of each session, a 20€ voucher was drawn as a reward for participation. Before leaving, participants filled in a questionnaire assessing social demographic data (e.g. age, gender, level of schooling). All the procedures were carried out in accordance with the ethical standards of the APA and were approved by all the institutions involved.

Analytic strategy

The content of the focus groups was transcribed verbatim and thematic content analysis was conducted using computer assisted qualitative data analyses software (MAXQDA 10). All names were removed from the texts and replaced by letters to ensure the confidentiality of comments.

Sampling units were defined semantically by identification of the underlying theme. Coding was carried out using a coding scheme based on the HAPA that included six categories for FV consumption determinants (risk perception, outcome expectancies, action self-efficacy, action planning, coping planning and maintenance self-efficacy). The

Table I. Questioning guide under the topic ‘Social cognitive determinants for fruit and vegetable consumption’

HAPA constructs	Question sample
Risk perception	‘Do you feel at risk of any health problems?’ ‘How did (could) that change your nutritional habits?’
Outcome expectancies	‘What would be the consequences of eating at least 5 portions of fruit and vegetables a day?’
Action planning	‘Imagining you decided to eat at least 5 portions a day, how do you think you could manage to achieve this goal?’
Coping planning (barriers)	‘What difficulties might arise that could prevent you from eating 5 portions a day?’
Coping planning (strategies)	‘How could you overcome those barriers?’
Action self-efficacy	‘Would it be easy for you to start eating at least 5 portions of fruit and vegetables every day?’
Maintenance self-efficacy	‘Once you had started, do you think it would be easy to maintain eating those 5 portions a day?’

coding of all the transcripts was performed by the first author. Two judges, familiar with the HAPA model, were given the same coding scheme and independently coded 25% of the material. After resolving some disagreements through discussion, the inter-rater agreement was 0.86 (Krippendorff’s alpha).

Prioritizing the identified beliefs (Questionnaire)

Participants

A total of 393 participants, 131 men (aged 17–60 years; mean = 30.6; SD = 9.5) and 262 women (aged 18–70 years; mean = 28.1; SD = 8.2), completed an online questionnaire that was distributed through the mailing lists of the two faculties of psychology. None of the participants had any medical restriction regarding the consumption of FV.

Measures

An online questionnaire was developed to prioritize beliefs under the constructs addressed in the focus groups where great variability was encountered, namely outcome expectancies (23 items), barriers encountered for eating FV (16 items) and coping planning strategies to overcome those barriers (11 items). As the information on risk perception and on specific action plans for increasing FV intake, collected through the focus groups, was very consistent across groups and that, although quantitative differences in self-efficacy beliefs were found between

people at different stages, no qualitative differences in substantive self-efficacy beliefs were found across stages, these three constructs were not included in the questionnaire. Thus, the information was considered as being sufficiently informative for health messages’ development.

Outcome expectancies. The outcome expectancies measure began with ‘What do you think (are/would be) the consequences (of eating/if you started to eat) at least 5 portions of FV every day? If I ate at least 5 portions of *fruit and vegetables* a day . . .’, and was followed by 23 positive and negative outcomes (e.g. ‘I would feel better’; ‘I would not feel satiated after meals’) that were derived from the qualitative analysis of the focus groups. Responses were given on a 7-point scale ranging from 1 (‘totally disagree’) to 7 (‘totally agree’). The reliability of this scale was $\alpha = 0.76$.

Coping planning (barriers). Participants were asked ‘To what extent do you think each of the following things (make it difficult /could make it difficult) to eat at least 5 portions of FV a day, provided you decided to eat this amount of fruit and vegetables a day?’. A total of 16 barriers identified through the qualitative analysis (e.g. ‘I hardly ever feel like eating fruit and vegetables’; ‘It is hard to find options that include fruit and vegetables when eating out’) were included as items. The response scale ranged from 1 (‘it does not make it difficult at all’) to 7 (‘it makes it a lot more difficult’). The reliability of the scale was $\alpha = 0.86$.

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Coping planning (strategies). The question: 'As a way to overcome the barriers that prevent you from eating more fruit and vegetables, to what degree would it be important for you . . .', was followed by 11 items (e.g. 'to make healthier options, that include fruit and/or vegetables when eating out'; 'to buy fruit to have at work') which were strategies derived from the analysis of the focus groups. Responses were given on a 7-point scale with endpoints of 1 ('not important at all') to 7 ('very important'). The reliability of the scale was $\alpha = 0.86$.

Intention. Two items, one for fruit and another for vegetables, were used to access the intention to eat FV: 'Do you intend to eat more (fruit/vegetables) in the following month? If so, how many portions of (fruit/vegetables) do you intend to eat daily in the next month?'. Responses were given on a 4-point scale ranging from 1 ('definitely not') to 4 ('definitely yes'). The inter-correlation between the intended amount of fruit intake and of vegetable intake was moderate and significant ($r = 0.51$, $P < 0.001$).

FV intake. Two items were used to measure FV intake, the first concerning fruit intake and the latter vegetable intake: 'In the last two weeks you ate a (portion of fruit/vegetables) . . .', and was followed by some examples of what constitutes a portion of FV. Responses ranged from 0 ('a few times a week or less') to 5 ('more than four times a day'). The inter-correlation between the amount of fruit intake and vegetable intake was moderate and significant ($r = 0.46$, $P < 0.001$).

Stage of change. Based on the responses to the items accessing actual intake and intentions regarding FV consumption, stage of change was determined by means of the same algorithm used on the focus groups (Fig. 1).

Procedure

Invitations to participate in the study were made by an e-mail presenting the purpose of the study (i.e. getting to know peoples' ideas about food and nutrition) and containing the link to access the questionnaire. Before responding to the online

questionnaire, participants were assured about confidentiality of all the data to be collected. Their informed consent was then provided in accordance with the ethical standards approved by both institutions at the time the study took place.

Analytic strategy

In order to determine if there were differences between non-intenders and intenders regarding specific outcome expectancy beliefs and between intenders and actors regarding specific barriers and strategies, multiple ANCOVAs were run, one for each specific belief. Variables where differences were found between stages of change groups, such as gender, age, having children, household income level and residence area, were included as covariates.

With a view to determining the outcome expectancies that were the best single predictors of intention, a regression analysis was conducted for the 23 beliefs on intention. This analysis was performed using the non-intenders sub-sample, given that the non-intenders group is the one that would benefit more from an increase in positive outcome expectancies and/or a decrease in negative outcome expectancies. A further two regressions were performed both for barriers and strategies for eating FV on behaviour. These analyses were performed using the intenders sub-sample, given that intenders were expected to benefit more from an intervention targeted at coping planning beliefs. All regressions were performed using the stepwise method to select the best set of predictors. This method was chosen because it is specially recommended when the predictors are significantly correlated [29].

Finally, for the selection of the specific outcome expectancies, barriers and strategies to overcome those barriers to be included in the health messages, three criteria were sequentially articulated: (i) those that enabled to establish significant differences between the target groups [25], (ii) those that were predictors of intention (in the case of outcome expectancies) or of behaviour (in the case of barriers and strategies) [25] and (iii) those that were rated as being relevant/important by the target group.

Results

Focus groups

Descriptive findings

The average intake of FV for the whole sample was 2.95 (SD = 2.31), 1.87 (SD = 1.45) among non-intenders, 1.82 (SD = 1.13) among intenders and 6.27 (SD = 1.27) among actors. In total, 75% of the sample ate less than the minimum amount recommended by the World Health Organization (i.e. less than five portions a day).

Some differences were found among participants across stages of change, with more men participating in groups of non-intenders, $\chi^2(2) = 6.99$, $P = 0.03$ and more actors living in rural areas $\chi^2(2) = 12.48$, $P < 0.01$. However, there were no significant differences across the stage of change groups in terms of age, schooling, income level, having children and number of people in the household.

Identification of beliefs under HAPA constructs

Risk perception. Several participants mentioned having changed or being willing to change their habits regarding the consumption of FV after experiencing a health problem. Older participants, in particular, referred to having changed their diets due to a health condition or for being currently more concerned about their health than when they were younger. Some younger participants also referred to the fact that having a health problem would be the only reason to motivate them into eating more FV: 'Getting a fright, I would have to have a fright to shake me up' (Group 6, man, 23 years). Others mentioned that becoming a parent had made them think more realistically about the risks of bad nutritional habits, which was an important trigger to their changing process. Although participants recognized that FV intake is generally good for health, some revealed that they were not aware of the risks of low FV intake or of the benefits of eating FV for the prevention of specific diseases such as cardiovascular diseases and cancer: 'I knew we should eat 5 portions of fruit and vegetables a day, but I did not

know that could help to prevent cancer' (Group 1, woman, 21 years). Furthermore, many participants showed that they were not aware of the recommended amount of FV that should be eaten every day.

Outcome expectancies. A high range of outcome expectancies for FV consumption were identified through analysis of the qualitative data. In general, outcome expectancies for FV consumption were mostly positive. The most cited positive outcome expectancies were health benefits, including having a healthy lifestyle, having better health and preventing diseases such as cancer and cardiovascular diseases. Pleasure in eating FV and weight reduction were the second and third most common outcome expectancies related to FV consumption. Other positive outcome expectancies included well-being, looking better and slower aging and being socially accepted and trendy: 'It's somewhat fashionable. [People associate] salad, healthy... Advantage is taken of this' (Group 8, woman, 40 years). Some participants also referred to eating FV as a means to compensate for other unhealthy behaviours (e.g. overeating, eating non-healthy foods and for not doing physical exercise) or an alternative option to eating other foods: 'Because by doing so, I actually eat less of the main meat or fish dish' (Group 7, woman, 20 years).

Negative outcome expectancies were far less cited, and were only mentioned by non-intenders and intenders, not by actors. Several participants shared the belief that most of the FV available nowadays in the market are of poor quality due to a high amount of pesticides used in their cultivation and their poor nutritional properties: '(fruit and vegetables) no longer have so many vitamins and properties... ' (Group 4, man, 55 years). Other negative outcome expectancies included dislike and FV not being fulfilling enough: 'it is often far more important for people to feel full with pasta, rice and potatoes rather than being fulfilled with fruit or lettuce which do not fill at all' (Group 3, woman, 46 years). Fewer participants mentioned the discomfort when eating FV in some social contexts, such as parties: 'The other day I was at a party and someone said: "There you are, eating healthily!" [meaning] "You

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are not letting yourself go like us” (Group 6, woman, 42 years) or taking FV from home to eat at work or at school: ‘in terms of society, at least this is how I see it, people live according to the opinions of others rather than in terms of what they feel like doing or what is actually good for them. Thus (...) not being used to taking a piece of fruit may also be related to this: “It is pointless, people would make fun of me”’ (Group 3, man, 24 years). One participant even said that it might not be healthy or advisable to eat the five portions a day, because in that case one would not be eating the necessary amount of proteins that should be part of a balanced diet. Another mentioned that in such cases people would be taking in more calories than they would burn.

Action planning. Plans regarding eating five or more portions of FV per day were consistent across participants in all stages of change, and included eating soup at lunch and dinner, accompanying main dishes with a salad or vegetables and eating fruit throughout the day (before or at breakfast, mid-morning, mid-afternoon, before going to bed). One participant suggested: ‘If one eats fruit mid-morning, another mid-afternoon, opting at lunch for soup and a salad, and arriving home at night and having another soup and another piece of fruit, I think we will already have reached the five [portions]’ (Group 4, woman, 47 years). Eating soup was mentioned in all groups and—with few exceptions—represented a very important form of vegetable consumption for the majority of participants: ‘I always have to eat soup at lunch—soup is essential’ (Group 2, woman, 53 years). In contrast, only a few participants mentioned drinking natural juices. When planning how to increase their intake of FV, some participants said they could take FV with them to school/work or when going to the beach and cook with more vegetables: ‘making an effort every day. When I am cooking, using vegetables every day and always being willing to use vegetables’ (Group 6, man, 23 years).

Coping planning. Several barriers for eating five or more portions of FV a day were identified by participants of the focus groups. Lack of time and/or having a stressful life, difficulties related to the preparation of FV and eating out were the

barriers that were most mentioned by participants. Lack of time and /or having a stressful life: ‘Stress... Work demands so much of people that they don’t even think about it’ (Group 4, man, 23 years) were only mentioned by non-intenders and intenders. The preparation of FV as a barrier included peeling [e.g. ‘Fruit is not the easiest thing to eat; because it normally has to be peeled and gets your hands dirty (...)’ (Group 6, woman, 42 years)], washing [e.g. ‘Perhaps it would take longer as they have to be washed. A packet of biscuits is more practical for me; I just put it in my bag, and that’s it!’ (Group 4, woman, 44 years)], cooking [e.g. ‘Yes, meat is much easier, much quicker. (...) [Fruit and vegetables] involve more work...’ (Group 4, woman, 44 years)] and knowing how to cook FV [e.g. ‘Usually, the majority of people do not know how to cook them’ (Group 4, woman, 47 years)]. Eating out was also a very cited barrier, because FV were often not available in places where people go to eat and that it was not practical to take fruit or vegetables to eat in the workplace/school [e.g. ‘I end up taking as little as possible so I don’t have to carry too much around with me. So, I just have a main dish and that is enough!’ (Group 3, man, 24)] or even that it was easier to give into temptations when eating out.

Other barriers that were mentioned less frequently were that FV were not tempting and that they were pricey. A few participants also shared some nutritional beliefs that might have prevented them from eating more fruit (e.g. that one should avoid eating more than one type of fruit at a time, or eating acidic fruits, like oranges, in the evening). Making just a few meals per day, not being used to eating FV, forgetting to eat FV and fatigue, especially in the evening, after a tiring day and arriving home late, were also less frequently mentioned as barriers to FV consumption.

Groups diverged in the number of barriers to the consumption of five or more portions a day that were cited. Non-intenders indicated more barriers than intenders and actors could only recall very few barriers. Furthermore, the type of barriers invoked varied across groups: lack of time/having a stressful life and lack of quality/trusting the quality of the

available FV were more referred to by non-intenders than by the other stages, whereas intenders, who were already willing to eat more FV, mentioned more barriers related to the preparation of FV than people at the other stages.

Participants mentioned several strategies for overcoming these barriers, such as: planning meals ahead and taking food from home; making healthy choices to include FV when eating out (e.g. asking for salads, soup and fruit when eating at restaurants and cafes); making FV look and taste better (e.g. adding some condiments in the preparation of vegetables or serving fruit with yoghurt); showing that FV are easy to prepare, being a practical choice when one has little time; showing that FV are not expensive and to acquire the habit of starting a meal with soup and ending it with fruit. One participant revealed another kind of strategy used: 'I buy three types of vegetables at a time. [...] When I'm not willing to cook them, "Oh, I have to cook it, because otherwise it will go bad"' (Group 8, woman, 39 years).

Self-efficacy beliefs. Regarding action self-efficacy, most of the participants expressed the belief that eating five portions a day was a realistic goal, although it might not always be easy to achieve, because in order to do so frequently means changing well-established eating habits and routines: 'You only need to have soup at lunch and dinner; an apple at lunch and mid-afternoon and that's it, you've got the five portions (...) but it's [hard to change] a habit!' (Group 8, woman, 2). There were, nonetheless, some differences across groups. Whereas none of the actors expressed a lack of confidence in being able to eat five portions of FV a day, almost half of the non-intenders and some intenders expressed the thought that eating five portions of FV a day was an unrealistic goal and that it would not be easy to do it on a regular basis.

With regard to maintenance self-efficacy, opinions were consensual. Regardless of the stage of change, participants shared the belief that once one started eating five or more portions of FV a day, it was not difficult to maintain: 'I think it is really hard to change. But from the moment we start that routine, after we miss that piece of fruit or that

meal... For instance, for me eating a meal without greens, I feel something is missing...' (Group 3, woman, 46 years). FV consumption was, thus, conceived as a habit that once acquired is difficult to break. One participant stated: 'Several years ago, I hardly ever ate soup or vegetables. But now, I could not let a single day go by without soup' (Group 3, woman, 49 years).

Online questionnaire

Descriptive findings

The average FV intake was 3.25 portions a day (SD = 1.94) for the whole sample, with an average intake of 2.11 (SD = 1.23) among non-intenders, 3.00 (SD = 1.14) among intenders and 5.77 (SD = 1.16) among actors. A total of 73.8% participants ate less than five portions a day, with 52.9% of the sample being classified as non-intenders, 20.9% as intenders and 26.2% as actors.

Several differences were found across stages of change, with more men being classified as non-intenders, $\chi^2(2) = 13.14, P < 0.01$, the mean age of actors being higher than that of non-intenders, $F(2, 325) = 5.47, P < 0.01$, more actors having children, $\chi^2(2) = 11.68, P < 0.01$, more actors reporting having a household income level of above 2400€ per month, $\chi^2(10) = 18.31, P = 0.05$ and less non-intenders living in a rural area, $\chi^2(2) = 6.48, P < 0.05$. However, there were no differences between stages regarding schooling or number of household members.

Prioritizing the identified beliefs

Outcome expectancies. A total of eight outcome expectancies differed significantly between non-intenders and intenders, with positive outcome expectancies being higher among intenders and negative outcome expectancies being higher among non-intenders (Table II). When compared with non-intenders, intenders were more keen to agree that were they to eat five portions of FV a day they: would improve health, $F(1, 206) = 8.45, P < 0.01$; would prevent cardiovascular diseases, $F(1, 206) = 8.62, P < 0.01$; would be an example to their children, $F(1, 206) = 4.94, P = 0.03$,

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Table II. Estimated marginal means and SDs for outcome expectancies for non-intenders and intenders and semi-partial correlation coefficient for intention among non-intenders

Outcome expectancies	Mean (SD)		Semi-partial R^2
	Non-intenders	Intenders	
I would improve my health	5.91** (0.08)	6.33 (0.12)	0.08**
I would prevent cardiovascular diseases	5.75** (0.08)	6.16 (0.12)	n.s.
I would be an example to children	5.56* (0.10)	5.96 (0.15)	n.s.
I would feel better	5.45* (0.10)	5.89 (0.15)	n.s.
I would encourage my family to eat better	5.14 (0.11)	5.60 (0.18)	0.02*
I would look better	5.13 (0.11)	5.25 (0.16)	n.s.
I would slow aging	5.08 (0.10)	5.36 (0.16)	n.s.
I would prevent cancer	5.06** (0.09)	5.48 (0.14)	n.s.
I would eat less of other less healthy foods	5.02** (0.14)	5.71 (0.22)	n.s.
I would lose some weight	4.85 (0.13)	5.25 (0.20)	0.03**
I would live longer	4.84 (0.10)	5.02 (0.15)	n.s.
I would feel satisfaction and pleasure	4.83** (0.09)	5.58 (0.14)	0.06**
I would cause a good impression on others	4.18 (0.13)	4.11 (0.20)	n.s.
I could compensate for other unhealthy habits (e.g. overeating, not exercising)	4.15 (0.15)	4.09 (0.24)	n.s.
I would have to make an effort to learn how to cook with vegetables	3.69 (0.15)	3.26 (0.23)	n.s.
I would have to spend more time preparing meals	3.49 (0.14)	3.15 (0.22)	n.s.
I would not feel satiated after meals	3.01 (0.13)	2.69 (0.20)	n.s.
I would compromise my social life (especially in parties, with friends)	2.66 (0.13)	2.39 (0.20)	n.s.
I would feel inadequate in certain situations	2.63 (0.12)	2.20 (0.19)	n.s.
My eating patterns would not be healthier because of this	2.55 (0.13)	2.79 (0.20)	n.s.
I would have to start eating fruit and vegetables that do not have good quality	2.52 (0.12)	2.47 (0.18)	n.s.
It would be a sacrifice for me, because I do not like fruit/vegetables very much	2.41* (0.12)	1.86 (0.19)	n.s.
People would make fun of me	1.68 (0.10)	1.39 (0.15)	n.s.

Adjusted $R^2 = 0.217$

'Gender', 'Age', 'Area of residence', 'Having (or not) children' and 'Income level of the household' were included as covariates in the ANCOVAs; non-intenders, $n = 150$; intenders, $n = 62$.

* $P < 0.05$; ** $P < 0.01$.

would feel better $F(1, 206) = 6.17, P = 0.01$, would prevent cancer, $F(1, 206) = 6.64, P = 0.01$, would eat less of other less healthy foods, $F(1, 206) = 8.02, P < 0.01$, would feel satisfaction and pleasure, $F(1, 206) = 18.77, P < 0.001$. Conversely, non-intenders agreed more than intenders that eating five portions of FV a day would be a sacrifice, $F(1, 206) = 6.04, P = 0.02$.

The linear multiple regression analysis indicated that among non-intenders, four outcome beliefs independently predicted intention : I would improve my health, $\beta = 0.32, t(203) = 4.53, P < 0.001, I$

would feel satisfaction and pleasure, $\beta = 0.27, t(203) = 4.12, P < 0.001, I$ would lose some weight, $\beta = 0.18, t(203) = 2.78, P = 0.01, I$ would encourage my family to eat better $\beta = -0.15, t(203) = 2.20, P = 0.03$. Each of these beliefs independently accounted for between 2 and 8% of the variance of intention. Together, these four beliefs accounted for 21.7% of the variance of intention (Table II).

Coping planning. Five barriers were significantly rated as being more important for intenders than for actors: feeling tired, $F(1, 131) = 5.03,$

$P=0.03$, forgetting, $F(1, 131)=6.32$, $P=0.01$, considering that FV go bad very easily, $F(1, 131)=12.26$, $P<0.01$, not having the desire to eat them, $F(1, 131)=3.86$, $P=0.05$ and preparation, $F(1, 131)=4.13$, $P=0.04$. There was also a trend towards significance for the barrier 'perceiving one's life as being stressful', $F(1, 131)=3.35$, $P=0.07$ (Table III). No strategy was differentially rated between groups of intenders and actors (Table IV).

Two linear multiple regression analyses were run independently: one for the barriers and another for the strategies. The results show that forgetting to eat FV was a significant predictor of behaviour among intenders, $\beta=-0.26$, $t(80)=-2.45$, $P=0.02$, meaning that the more intenders reported forgetting to eat FV, the less they ate FV. This barrier accounted for 1.6% unique variance on behaviour. Furthermore, among intenders, knowing that it is possible to save money by eating FV, $\beta=-0.36$, $t(79)=-3.16$, $P<0.01$ and adding other ingredients or condiments to FV, $\beta=0.23$, $t(79)=2.03$, $P=0.05$ were predictors of behaviour. Together, these two strategies account for 9.7% of variance of behaviour.

Discussion

Research has established that interventions and particularly health communications are more effective when targeted and grounded on theory [16]. However, many campaigns are still not theoretically guided or evidence-based, and that has been pointed as a reason for the mixed findings on health message effectiveness [22]. In this study, we conducted a formative research based on the HAPA model that can be used to sustain the development of theory-based health messages promoting FV intake. Our interest was to unravel the substantive contents under the constructs proposed by the model as being important targets for intervention both for non-intenders and intenders.

Target beliefs for non-intenders

The findings of this study support the premise that messages targeted at non-intenders should focus on

increasing personal risk perception towards several health problems due to low consumption of FV. This, in turn, will contribute to an enhancement of the self-efficacy perception to follow the recommendations for FV consumption and to stress positive outcomes related to FV consumption.

While perceiving oneself to be at risk of a health condition might not be enough for individuals to succeed in changing their eating habits [19, 30], it might, nonetheless, be a trigger to start contemplating changing one's diet. Different events over the life cycle—becoming a parent, growing older or suffering from a disease—were indicated as crucial turning point moments in relation to eating patterns. Therefore, risk perception might still be an important intermediate target variable when developing health messages for non-intenders, in order to personalize the risk and deter defensive optimism [31]. Clearly communicating the standards related to the amount of FV that should be eaten daily is also of paramount importance, especially in countries where the campaigns related to FV intake have not included a quantitative recommendation so far. Hence, some individuals may not feel at risk simply because they think that they are already eating an adequate amount of FV, even if such is not the case.

Our findings showing that non-intenders were less confident in their own ability to start eating at least five portions of FV per day (i.e. action self-efficacy), when compared with intenders and actors, are in line with both the theoretical expectations derived from the HAPA model and results of previous studies showing that self-efficacy is one of the factors most strongly and consistently associated with actual FV intake [32]. Considering that self-efficacy may be promoted by verbal persuasion [33] and that interventions in self-efficacy beliefs have proven to be successful in increasing FV intake [28], enhancing individuals' action self-efficacy towards FV consumption should also be a goal of health communications targeting non-intenders.

In keeping with previous studies on the determinants of FV consumption [34, 35], the most important outcome expectancies were related to the positive health consequences of eating FV, to the satisfaction

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Table III. Estimated marginal means and standard deviations for barriers among intenders and actors and semi-partial correlation coefficient for behaviour among intenders

Coping planning (barriers)	Mean (SD)		Semi-partial R ²
	Intenders	Actors	
It is hard to find options that include fruit and vegetables when eating out	3.87 (0.26)	4.01 (0.23)	n.s.
My life is very stressful	3.37 (0.22)	2.69 (0.21)	n.s.
When I am tired I do not feel like eating fruit and vegetables	3.34* (0.24)	2.53 (0.22)	n.s.
Fruit and vegetables are expensive	3.33 (0.24)	3.08 (0.22)	n.s.
I forget to eat fruit and vegetables	3.14* (0.23)	2.34 (0.21)	0.16**
I have little time during my daily life	3.12 (0.23)	2.86 (0.21)	n.s.
I do not trust the quality of the fruit and vegetables that are available (they have lots of pesticides)	3.12 (0.23)	2.63 (0.21)	n.s.
I do not buy fruit and vegetables very often because they go bad very easily	3.05** (0.21)	2.10 (0.20)	n.s.
I do not eat many meals per day	2.96 (0.23)	2.60 (0.21)	n.s.
Fruit and vegetables are not very practical to eat on some occasions	2.96 (0.23)	2.76 (0.22)	n.s.
I do not eat acidic fruit at night, like oranges	2.76 (0.25)	2.48 (0.23)	n.s.
The majority of fruit and vegetables have poor quality and taste	2.71 (0.21)	3.35 (0.19)	n.s.
I hardly ever feel like eating fruit and vegetables	2.58* (0.21)	1.96 (0.19)	n.s.
It is laborious to peel fruit and to prepare vegetables	2.43* (0.21)	1.85 (0.19)	n.s.
One should not eat different fruit at the same time	2.04 (0.21)	1.93 (0.20)	n.s.
I do not like the smell that lingers on my hands after peeling some fruit	1.71(0.18)	1.56 (0.16)	n.s.

Adjusted R² = 0.07

'Gender', 'Age', 'Area of residence', 'Having (or not) children' and 'Income level of the household' were included as covariates in the ANCOVAs; intenders, *n* = 62; actors, *n* = 75.
 P* < 0.05; *P* < 0.01.

and pleasure (or 'liking') provided by eating FV and to losing weight. Interestingly, these beliefs were simultaneously the most cited in the qualitative part of the study, allowing for a distinction of non-intenders from intenders, while also being predictors of the intention to increase FV intake, therefore revealing some consistency in the overall pattern of findings. Such beliefs should, therefore, be included in health messages targeting non-intenders.

Target beliefs for intenders

Messages targeted at intenders should focus on presenting concrete action plans for increasing FV intake that are in line with already existing eating patterns and outline some common barriers faced by those wanting to increase their FV intake as well as possible ways of overcoming such barriers. Verbal incentives reassuring the message recipients about their competence to maintain an adequate daily

consumption of FV, even in the face of obstacles, is also recommended.

Plans to increase FV intake (i.e. action planning) were very consistent across groups and were built around nutritional habits that tend, nonetheless, to vary substantially across cultures. For example, references to vegetable soup were very frequent in the discourses of the focus group participants and assumed a prominent position in the plans they made on how to increase the amount of FV eaten every day. This observation is consistent with the results of a survey on nine European countries showing that unlike the northern countries where raw vegetables are consumed to a larger extent, the main intake of vegetables of Portuguese children comes from vegetable soup [36]. The same applies to drinking natural fruit juices that were seldom mentioned by the focus groups participants, whereas in other countries such as Austria and the

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Table IV. Estimated marginal means and standard deviations for strategies among intenders and actors and semi-partial correlation coefficient for behaviour among intenders

Coping planning (strategies)	Mean (SD)		Semi-partial R^2
	Intenders	Actors	
To choose more healthy options, that include fruit and vegetables, when eating out	5.73 (0.19)	5.39 (0.18)	n.s.
To buy fruit to have at work	5.54 (0.20)	5.72 (0.18)	n.s.
To better plan the meals	5.51 (0.20)	5.16 (0.19)	n.s.
To acquire the habit of starting the meal with soup or salad and end it with fruit	5.45 (0.20)	5.45 (0.19)	n.s.
To know that there are quick and practical ways of preparing fruit and vegetables	5.21 (0.20)	5.48 (0.18)	n.s.
To know that it is possible to save some money by eating more fruit and vegetables	5.19 (0.22)	4.93 (0.20)	0.11**
To take food from home that includes fruit and/or vegetables when eating out	4.94 (0.22)	5.29 (0.20)	n.s.
To add other ingredients or condiments to fruit and/or vegetables to improve their appearance and taste	4.22 (0.26)	3.76 (0.24)	0.05*
To keep fruit at home in a more accessible place	4.12 (0.24)	4.19 (0.22)	n.s.
To buy a lot of fruit and vegetables and then feel obliged to eat them	3.40 (0.24)	3.72 (0.22)	n.s.
To peel/prepare a lot of fruit at once and have it ready to eat in the fridge	3.37 (0.26)	2.99 (0.24)	n.s.
			Adjusted $R^2 = 0.097$

'Gender', 'Age', 'Area of residence', 'Having (or not) children' and 'Income level of the household' were included as covariates in the ANCOVAs; intenders, $n = 62$; actors, $n = 75$.

* $P < 0.05$; ** $P < 0.01$.

Netherlands, natural fruit juices constitute an important part of the overall FV intake [36]. Therefore, health messages aiming to increase FV consumption should also be sensitive to the existing dietary patterns of the audience in question.

As for the barriers, besides FV preparation, environmental constraints, such as lack of time, price and availability, were the most commonly cited. These factors have frequently been mentioned in studies exploring the barriers for FV intake [34, 35], although the environmental constraints were not found to differentiate people at different stages nor to predict behaviour. Even if expectations stemming from the HAPA model pointed to self-regulation of behaviour as playing an important role in the transition from an intentional to an action stage, to our knowledge, beliefs related to self-regulation such as lack of self-regulatory strength (i.e. 'When I am tired I do not feel like eating fruit and vegetables') and lack of awareness (i.e. 'I forget to eat fruit and vegetables') have not been put forward in

previous studies mentioning the barriers for FV intake [37, 38]. Nonetheless, these emerged as important barriers for intenders, distinguishing them from actors, and the latter example being a predictor of behaviour. Other barriers worth considering when developing messages for intenders should be that FV spoil easily and not feeling like eating FV and preparing them.

None of the strategies mentioned for increasing FV intake differentiated intenders from actors, but adding other ingredients to FV to improve their appearance and taste was predictive of behaviour and should, therefore, be considered for message development targeting intenders. The negative relationship between saving money by eating more FV and behaviour may stem from the fact that the more individuals eat FV the less they value the economic argument as an incentive for eating FV. Nonetheless, experimental research must be conducted in order to determine the actual causal direction.

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In all stages people agree on their ability to maintain the eating of five portions of FV a day, once started. This maintenance self-efficacy belief was rooted in the view that FV consumption is mainly determined by habit. In fact, although not explicitly included in the HAPA model, habit or ‘past behaviour’ has been regarded as an important determinant of behaviour [39] and has been identified as an important predictor of eating behaviours [40]. When geared towards adult populations, health messages on FV intake can either reinforce already existing habits in the sense that those behaviours become even more frequent [34] or take advantage of context-disruptive events such as life-cycle transitions for the implementation of novel routines [41]. In either case, and despite this optimistic view, the fact that habits are not established from one day to another and that barriers might arise in the process of behavioural maintenance should be borne in the mind of the audience. Therefore, strengthening beliefs of maintenance self-efficacy when faced with barriers should be an intervention goal towards intenders.

Limitations

Some limitations may be pointed out in this study. The results were obtained with a convenience sample and might, therefore, not be indicative of the whole target population. As participation was voluntary, these people may very well have been particularly interested in the topic, thus, introducing some bias. Moreover, cultural influences might play a role, as outlined above, even if, overall, the present findings are very similar to studies conducted in other countries [34, 35]. Also, due to the cross-sectional nature of the quantitative part of the study, it is not possible to draw firm conclusions as far as causality is concerned.

Conclusion

This research study contributes to the identification of an array of beliefs on FV intake under theoretical constructs of the HAPA model that are relevant for the construction of health messages, targeted at

different stages of change. Future research should investigate whether health messages designed on the basis of the present findings would be more effective in the promotion of FV intake when matched to individuals’ stage of change than when they are mismatched. Hence, support would be provided both for the described development process and for the relevance of the use of the stage of change construct when targeting health messages.

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