Determinants of healthy eating: motivation, abilities and environmental opportunities

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Background. In order to promote healthful nutrition, insight is needed in the behavioural determinants of nutrition behaviours. Most research on behavioural determinants has been restricted to individual-level motivational factors. However, health behaviour is influenced by individual motivation and abilities, as well as environmental opportunities.

Objective. To provide an overview of motivation, ability and opportunity-related potential determinants of nutrition behaviours and of the evidence for associations of potential environmental determinants with nutrition behaviour.

Method. A narrative review informed by a series of six systematic reviews including more than 400 original studies and recent original studies on associations of environmental factors with nutrition behaviours.

Results. Although the number of studies on potential environmental determinants of nutrition as well as physical activity behaviour has increased steeply over the last decades, these include only few well-designed studies with validated measures. Preliminary evidence from the available systematic reviews indicates that social support and modelling, availability and accessibility of healthy and less healthy foods as well as socio-economic status are important for nutrition behaviours; schools and worksites offer good settings for improving healthful nutrition opportunities.

Conclusion. Although the evidence to date is inconclusive due to lack of well-designed studies, specific social–cultural, physical and economical environmental factors appear of importance for healthful nutrition.

Keywords. Behaviour, behavioural determinants, environment, nutrition.

Introduction

Diet and nutrition are major determinants of population health. Dietary behaviours and nutrition are associated with four of the top-five burdens of disease (high blood pressure, high cholesterol, obesity and low fruit and vegetable consumption).1 Across Europe and beyond, majorities of populations do not comply to recommendations regarding, for example, intakes of energy, saturated fat, sodium and fruits and vegetables. Public health interventions have been, are and should be designed and implemented to promote that more people engage in healthful eating habits.2

For planned promotion of population health, it is not enough to identify the risk behaviours, i.e. the specific dietary behaviours that cause ill health. We also need to identify why people engage in such risk behaviours. These behavioural determinants should be identified so that we can target and tailor health promotion interventions.3

The present paper describes and discusses the evidence for different categories of potential determinants of eating behaviours, with a specific focus on environmental factors. First, different categories of determinants of eating behaviours and different categories of potential environmental determinants will be introduced. Subsequently, the evidence from six systematic reviews the author was involved in of the different categories of potential environmental determinants will be summarized and consequences for interventions to promote healthy nutrition behaviours will be briefly discussed.
Determinants of health behaviours: motivation, ability and opportunity

With the overabundant range of food items on offer, people in market-economy countries can, to a large extent, choose what, when and how much they eat. To induce dietary change, one needs to change people’s food choices. To be able to do that, insight in to why people choose to eat what they eat is necessary.

Studies on determinants of eating behaviours have primarily focused on individual-level factors, such as taste preferences, nutrition knowledge, attitudes and intentions and insight in to such motivational determinants have informed health education interventions to promote more healthful eating habits, including nutrition advice and counselling by GPs. Such nutrition education approaches attempt to urge people to consciously adopt healthier eating habits by providing information about unhealthful eating and more healthful alternatives. However, such nutrition education interventions have had limited and mostly short-lived effects at best. More recently, it has been argued that the environment we live in may be the driving force behind many of our less healthful eating habits as well as lack of physical activity. It has, for example, been posited that the present-day food environment in market-economy countries is characterized by abundant—almost anywhere and anytime—availability and accessibility of energy-dense and energy-rich foods that strongly appeal to our innate and early acquired preferences for sweet, fat and salty. This, combined with a natural human tendency to eat when food is available and eat more when more is on offer, may lead to overeating and consequently to weight gain, overweight and obesity, as well as high intakes of saturated fat, refined sugars and salt. This more recent focus on environmental determinants of eating habits asks for a health protection approach to promotion of healthful eating, i.e. changing the environment to protect the population against exposure to foods and eating patterns that contribute to chronic disease risk.

The present paper builds on a series of reviews on environmental correlates of health behaviours I was involved in, and I will argue that it is the interplay between individual-level and environmental factors that determine food choices and eating habits. A framework proposed by Rothschild provides a simple and easy to understand point of departure to categorize the large and diverse number of potential determinants at these two levels. Rothschild identifies three categories of determinants: motivation, ability and opportunity.

**Motivation: attitude and personal norms**

Important theories of determinants of human health behaviour, such as the Theory of Planned Behaviour, Protection Motivation Theory and Social Cognitive Theory recognize behavioural decision or intention as the primary most proximal determinant of behaviour. Intentions can be regarded as the consequence of motivation. Each theory proposes different but similar determinants of intentions. Based on an integration of insights from the aforementioned theories, four groups of determinants that predict intention have been recognized: attitudes, self-representation, self-efficacy and social influences.

Of these, attitudes and self-representation are most directly related to motivation; self-efficacy is related to ability, and social influences will be further discussed in the paragraph on opportunities.

Attitudes are based on a subjective weighing of expected positive and negative consequences or outcomes of the behaviour. Closely related constructs are decisional balance, outcome expectations and perceived threat. Beliefs or expectations about short-term outcomes are more important than longer term outcomes. Taste, satiety and pleasure are short-term outcomes of major importance for most people. First of all, people tend to eat what they like and avoid foods they dislike. Certain taste preferences are innate, such as a liking for sweet and salt and a dislike for bitter. However, taste preferences can be learned and unlearned, and the fact that many people like the taste of coffee and beer illustrates that we can even unlearn our innate dislike of bitter tastes. Learning to like and dislike certain tastes are basic classical and operant conditioning processes, and we quickly learn to like the taste of foods that are reinforced by the pleasant feeling of satiety (taste-nutrient learning), that are eaten in pleasant surroundings or with pleasant company (taste-environment learning) and of foods that are combined with a taste that we already have a strong liking for (taste–taste learning). We therefore quickly learn to like foods high in fat and sugar (taste-nutrient learning), foods offered as rewards, at parties or encountered during holidays or other pleasant circumstances (taste-environment learning) and foods with added sugar or salt (taste–taste learning).

Health is a second category of outcome expectations of major importance for people’s food choice. Nevertheless, 40% of Americans and 57% of Europeans indicated rarely or never to compromise on taste to improve the healthfulness of their diets. Furthermore, in practice, health expectations may only influence food choices significantly for most people when the health consequences are expected to be soon, severe and easy to recognize. People may therefore quickly develop negative attitudes towards foods for which they are allergic or intolerant, i.e. foods that literally make them sick. But since energy-dense foods provide a comfortable feeling of satiety, beliefs about the potentially negative health consequences of eating such foods often do not have a strong impact on food
choice. Convenience is a third important factor that may shape food-related attitudes. In Europe, 42% of consumers indicated that convenience comes before health in making food choices, compared to 24% in US and Australia.

Self-representations or self-identity reflect what a person thinks of as important and stable characteristics of the self, i.e. the values and norms people adhere to. Less research has been conducted on self-representation than on attitudes related to food choice, but some personal values have been shown to be related to nutrition behaviours. People may see themselves, for example, as health conscious, environmental conscious or animal friendly. Such personal norms may induce specific dietary habits such as healthy eating, choosing organically grown foods or adopting a vegetarian diet.

From motivation to ability: self-efficacy, skills, knowledge and awareness
Self-efficacy, or perceived behavioural control, refers to the perception of, or confidence in, one’s abilities and skills to engage in certain behaviour. A person who is confident that he can cut back on saturated fat intake will be more motivated to do so even when faced with certain barriers. Self-efficacy is behaviour and context specific. A person can, for example, have high confidence to be able to eat less fat, but not to increase vegetable intake; and confidence to cut back on fat may be high for regular meals prepared at home, but not for eating out. Self-efficacy is strongly related to abilities and skills.

If self-efficacy is based on true personal abilities and skills, people are more likely to be able to translate their motivation into action. Skills and abilities are to some extent dependent on practical knowledge. For example, knowledge of recommended intake levels and healthy alternatives for unhealthy choices help to enable voluntary dietary change. Nevertheless, earlier research has shown that knowledge is often not a direct determinant of eating behaviours; some nutrition knowledge appears to be a necessary but insufficient prerequisite for health behaviour change.

Awareness of personal intake levels is another important ability-related factor. Caloric intake and expenditure are determined by complex collections of different specific acts, from choosing foods, portion sizes and preparation methods, to transportation, work and leisure time physical activities, it takes a great deal of food knowledge and good arithmetic skills to monitor one’s caloric intake or day-to-day energy balance. If the opportunities for objective self-assessment are lacking, people tend to compare their intakes to what they perceive ‘others’ do. Such social comparisons are liable to so-called optimistic bias resulting in people thinking that they already comply with dietary recommendations while they are not and to lack of motivation to change. Studies have shown that awareness of unhealthy eating habits is a strong positive correlate of intentions to make dietary changes.

Opportunities and support: physical and social cultural food environments
Defining the environment: the ANGELO framework. The environment can be defined as everything and anything outside the person. Environments may make healthier choices easier choices or may even reduce the number of options or possibilities for unhealthy choices. Just as personal factors have been further subdivided in more specific determinant constructs and proposed pathways of mediation, so can and should the environment be further defined by means of distinguishing various environmental factors. The ANGELO framework was specifically developed to conceptualize health behaviour environments related to obesity. It is a grid with two axes. On the first axis, two ‘sizes’ of environment (micro and macro) are distinguished. Micro-environments are defined as environmental settings where groups of people meet and gather. Such settings are often geographically distinct and there is often room for direct mutual influence between individuals and the environment. Examples of micro-environments are homes, schools, workplaces, supermarkets, bars and restaurants, other recreational facilities and also include neighbourhoods.

Macro-environments, on the other hand, include the broader, more anonymous infrastructure that may support or hinder health behaviours. Examples of macro-environments are how food products are marketed, taxed and distributed; the media may also be included in the macro-environment.

On the second axis, four ‘types’ of environments are distinguished: physical, economic, political and socio-cultural. The physical environment refers to availability of opportunities for healthy and unhealthy choices, such as points-of-purchase for fruits and vegetables, soft drink vending machines, availability of low saturated fat spreads in worksite cafeterias, etc. The economic environment refers to the costs related to healthy and unhealthy behaviours, such as the costs of soft drinks, fruits and vegetables or energy-dense snacks. The political environment refers to the rules and regulations that may influence food choice and eating behaviour. Bans on soft drink vending machines, availability of low saturated fat spreads in worksite cafeterias, etc. The socio-cultural environment refers to the social and cultural subjective and descriptive norms and other social influences such as social support for adoption of health behaviour and social pressure to engage in unhealthy habits.
Conclusions from recent systematic reviews of the literature

Most publications arguing that environmental factors drive unhealthy eating habits are position papers or narrative reviews and do therefore not provide systematic evidence in favour of a causal association between environmental factors and unhealthy eating habits or its consequences. Most of these position papers focus primarily on the presumed importance of the physical environment, i.e., the availability and accessibility of foods that contribute to unhealthful eating patterns.

Recently, six systematic reviews of the scientific literature up to 2005 were conducted under my supervision initiated and supported by the Netherlands Organization for Health Research and Development on environmental correlates (297 papers included in the reviews) and interventions (112 papers included) for nutrition behaviours and physical activity, for children, adolescents and adults in established market economy countries. These reviews of more than 400 original papers were published as a report in print and electronic form and in a series of papers in different scientific journals.

First, these systematic reviews reveal that research on potential environmental correlates of nutrition behaviours is becoming more and more popular, given the sharply increasing number of publications on this issue in the last decades. The reviews also indicate that micro-size environmental factors were more often studied than macro-level factors. Socio-cultural and physical environmental factors were most often included in the studies that were reviewed.

More importantly, the reviews of observational studies do not yet strongly support the recent claims that the environment strongly influences nutrition behaviours. For none of the categories of environmental factors have a majority of studies reported significant associations between environmental factors and the nutrition behaviours investigated.

Although outnumbered by observational studies, the intervention studies that were reviewed provide more consistent evidence regarding relevant environmental factors, but the range of environmental factors studied was small.

Based on an integration of the findings from the different reviews, we have drawn the following conclusions related to nutrition behaviours: (i) social support and modelling appear to be important for different nutrition behaviours especially in youth; (ii) parents have a crucial role in the nutrition behaviours of their children. They should not only provide a good example by eating right themselves but also by using parenting practices and styles that encourage and support healthy eating habits in their offspring; (iii) availability and accessibility of healthy and less healthy foods are important for nutrition behaviours in youth and adulthood; schools and worksites offer good opportunities to improve availability of healthful foods; (iv) children and adolescents from more deprived families are likely to have unhealthier diets, and lower household income is associated with less healthy diets in adults.

So the reviews indicate that social cultural environmental factors may have a more consistent influence on nutrition behaviours than the physical environment. Recent studies in The Netherlands further support this. Wind et al. and De Bourdeaudhuij et al. studied associations between a range of potential physical and social-cultural environmental factors with fruit and vegetable intakes. Their results indicate that family social cultural factors such as parental encouragement and modelling were stronger correlates of intakes than availability of fruits and vegetables. This finding is supported by a further systematic review of the literature focusing specifically on fruits and vegetables.

The number of conclusions we could draw from reviewing the more than 400 original studies was not very impressive. The relatively weak evidence found thus far should not be interpreted as absence of a relationship between the environment and nutrition behaviour. Despite the large number of studies, there is still a lack of high-quality studies and of study replications. Furthermore, many potentially relevant environmental factors have not been studied at all. The available research was focused on only a part of the environment, especially micro-level factors in the social–cultural and the physical environmental. These were typically home-environmental social factors and school–physical environmental factors (parental influences and school availability) for youngsters, and social support, home and worksite availability and accessibility factors in adults, with few studies on neighbourhood environmental factors. Studies on macro-size environmental factors were almost completely absent.

Limitations of the studies reviewed

Most studies applied weak study designs and non-validated measurement instruments. Nearly all the available observational studies used cross-sectional designs. They provided evidence for associations, but not for prediction or causation.

Most studies only presented simple associations between a presumed correlate and the behaviour; few studies used multivariate analyses, adjusting for other potential personal or environmental correlates of nutrition or physical activity behaviours. Many intervention studies did not include a control group. Only some recent studies used multi-level analyses to take
into account potential environmental correlates that are studied in non-independent samples, such as individuals clustered within neighbourhoods, schools or school classes.\textsuperscript{19}

Exposure to environmental factors and nutrition behaviour was mostly measured with non-validated self-report measures. One of the issues that need further exploration is the difference between objectively assessed environmental factors and subjective, perceived environments. In research focussing on presumed environmental determinants of health behaviours, there is an urge to use objective measures of the environment, for example, based on observations or audits. However, our reviews indicate that associations between environments and behaviour were stronger when subjective, self-report measures of environments were used, and recent research by Giskes \textit{et al.}\textsuperscript{26} also indicates that perceptions of availability and price of healthful foods are more strongly associated with food choice than objective availability and price data.

Our reviews also showed that studies that explored mediating and moderating pathways between potential motivational, ability-related and environmental determinants were largely lacking. Kremers \textit{et al.}\textsuperscript{27} posited and presented preliminary evidence that environmental factors may have a direct impact on health behaviours, but these environmental influences are likely to be mediated by individual-level factors, i.e. motivation and ability. For example, an environment that offers plenty of opportunities for healthy food choices may improve motivation to eat a healthy diet and may improve perceived abilities to eat healthily. Kremers \textit{et al.}\textsuperscript{27} suggest that the causal pathway between environments and health behaviour may be moderated by such factors as personality, habit strengths and level of awareness of personal health behaviours. For example, habitual behaviours were found to be triggered by environmental cues without conscious deliberations.\textsuperscript{28}

\section*{Discussion and implications}

Promoting healthy nutrition behaviours still relies mostly on health education techniques that try to motivate people to adopt more healthy lifestyles. GPs may importantly contribute to nutrition education discussing nutrition issues with their patients when they think this is appropriate and/or when protocols require them to do so. Research indicates, however, that large majorities of populations are already motivated to eat healthfully and to be physically active,\textsuperscript{29} but that nutrition education often has minor and short-lived effects at best. It has been argued that this is the case because the so-called obesogenic environment prevents people acting on their positive intentions. This obesogenic environment is characterized by high availability and accessibility of palatable energy-dense foods, as well as great opportunities to avoid almost any work, transport or leisure-time physical activities.

It has therefore been argued that interventions to promote more healthful nutrition and physical activity practices should adopt a health protection paradigm instead of the present-day focus on health education. A health protection approach means a focus on environmental changes that help to ‘protect’ the population against unhealthy nutrition and lack of physical activity, i.e. environmental changes that would make healthy nutrition and sufficient physical activity more likely or even unavoidable.

Interventions to promote healthy eating should address the most important and changeable determinants of healthy eating. To promote healthy eating, people should be motivated to do so, should be confident about their abilities and should preferably be exposed to environments that offer them easy opportunities.

This health promotion and protection approach—creating environmental opportunities for healthful behaviours but also protecting the population against opportunities for unhealthful behaviours—has been successful in the great achievements in public health such as the reduction of infectious diseases, promotion of traffic safety and reducing smoking. In recent years, especially school-based interventions to promote more healthful nutrition and/or physical activity behaviours among children and adolescents have been conducted in which such a more integral health education and health protection approach was used, where changes in the school or neighbourhood environments were an integral part of the intervention approach. Examples such as the Dutch Do-IT study and the cross-European Pro Children study show that such an integral approach can make significant changes in health behaviours and contribute to better body composition among young people.\textsuperscript{30,31}

In conclusion, the evidence for the importance of environmental opportunities for healthful eating is rather strong for social environmental factors but not for physical environmental influences. This lack of evidence should not be interpreted as evidence that the physical environment is not important. Better designed and focussed studies using more objective and validated measurement instruments should be conducted to explore the true associations between environmental opportunities and nutrition behaviours.

\section*{Declaration}

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