



## **Sustainable and Healthy Nutrition – How Do Young People Eat?**

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### **Abstract**

*The production, processing and consumption of our food play a decisive role in the consideration of human resource consumption. Against the current climate change, increasing land consumption, decreasing water availability and a growing world population, the review and adaptation of food systems in terms of social, ecological and economic sustainability is one of the central tasks both for politics and for the agricultural and food industry. Our nutritional habits are an important field of action for promoting ecologically sustainable development. However, it is not always easy for individuals to make the right decision in terms of a healthy and sustainable nutrition. Our eating behavior is highly complex and linked to other everyday activities in many ways. The following study attempts to uncover the extent to which young people eat sustainably and healthily. This question is considered in terms of the theory of planned behavior. The intention of young people to eat healthily and sustainably is considered, as well as other motivational factors such as attitude (ATT), subjective norm (SN) and perceived behavioral control (PBC). In addition, the level of knowledge on the topic and its influence on the intention is measured. A total of 171 students (age  $\bar{x}$ : 17.3; n = 96 ♀ / n = 75 ♂) from Bremen completed a questionnaire. The results clearly show that especially ATT and PBC toward sustainable and healthy nutrition correlate positively and significantly with intention. There is also a significant and positive correlation between knowledge (amount of information, system-knowledge and action-related-knowledge) and intention to eat healthily and sustainably. The results of the regression analysis also show that the theory-internal factors (ATT, SN and PBC) together explain 53% of the intention to eat healthily and sustainably. If knowledge is also taken into account in the model (self-evaluation of knowledge), the model explains a further 2% of the intention. In the extended model, ATT, PBC and knowledge are the key determinants of intention. It is clear from these results that these influencing factors should form the starting points in subsequent studies in order to sensitize students to healthy and sustainable eating habits.*

**Keywords:** *Theory of planned behavior, attitudes, knowledge, sustainable and healthy nutrition*

### **1. Introduction**

The production, preparation and consumption of our food play a significant role regarding people's consumption of resources. Around 28% of the resources consumed and 17% of greenhouse gas emissions in Europe are attributed to the European food industry [1]. Eating and drinking are elementary basic needs of humans. The sum of individual nutritional decisions and thus the demand for certain foods influences supply. A more productive agricultural and food industry is therefore needed. The food sector must therefore be reviewed and adapted in terms of sustainability. When it comes to nutrition, the personal, individual level meets the major challenge of reducing environmental pollution and resource consumption more clearly than in almost any other field of action.

Therefore, our diet is an important field of action for promoting ecologically sustainable development. However, it is not always easy for individuals to make the right decision in terms of a healthy and sustainable diet. Our eating behavior is highly complex and linked to other everyday activities in many ways. On the one hand eating behavior is strongly influenced by habits and eating decisions are not always made rationally. On the other hand it is not always clear which food need only a few resources in their production and which need much more. The way the food is composed and presented also influences people's health and well-being. Balanced and high quality food is one of the most influential factors in nutritional behavior [1].

Young people often do not prefer a healthy and sustainable diet. Often this decision does not depend on personal preferences but on social norms emanating from their peers. For example, young people tend to eat fast food, which is not only harmful to the environment, but also bad for their health (high in caloric value and low in nutritional value) [2]. There are also young people who tend to choose harmful and strict diets in order to approximate certain ideals of beauty. Malnutrition is often the result [2]. This study examines the factors that have a major influence on young people's decision to eat healthily and



sustainably. This study uses the theory of planned behavior to explain young student's nutritional habits and behavior towards a healthy and sustainable diet. Before the theory of planned behavior is presented, the concept of healthy and sustainable nutrition is defined.

## 2. Theoretical background

### 2.1 Nutritional recommendations for a sustainable and healthy diet

A healthy, sustainable diet means eating in such a way that the overall health, ecological, economic and social effects of our eating style are positive as possible. The primary goal of sustainable nutrition is to manage resources in a way that is sustainable for all generations: The living situation of today's generation should be improved without endangering the living situation of future generations [3]. Sustainable nutrition is therefore part of sustainable development, as set out by the United Nations in 2015 with the 2030 Agenda as a shared vision of sustainability [4].

Health and nutrition are closely linked. The aim of a sustainable diet is not only to avoid illness, but also to live as long as possible in complete or predominantly good health [5]. Several recent studies have shown positive effects of certain specific food on health [6,7,8]. Dietary recommendations have been derived from this. If such dietary recommendations are implemented, this maintains the individual's physical and mental fitness, prevents diet-related diseases and is a prerequisite for quality of life and well-being. Food that have positive effects on health are also correlated with positive effects on the environment. For example, minimally processed food from cereals, fresh vegetables and fruit, pulses as well as seeds and some nuts should be consumed more both in terms of their health effects and their low environmental impact [9]. Recommendations that focus on a plant-based, needs-based diet are therefore also of great benefit to the environment [10]. Another key area of action in food policy for sustainable nutrition is the appreciation of food, accompanied by a reduction in food waste and the resources required for its production. In principle, organically produced food contributes to environmental protection, even if the climate impact can vary depending on the displacement effects. Depending on the production and distribution process as well as storage, regionally produced food can have a better environmental impact than goods transported over long distances. This applies in particular to seasonal products from the region. At the level of citizens, energy-efficient purchasing and resource-efficient food preparation are also fields of action for a sustainable lifestyle [11].

### 2.2 The theory of planned behavior

The theory of planned behavior (TPB) concerns itself with the prediction and explanation of behavior. TPB is based on a rational conception of human nature and the rational determination of behavior. According to this, a person behaves rationally and uses the information available to them in such a way that they recognize the consequences of an action before they carry out an action or a certain behavior [12].

According to the theory, actions are directly controlled by intentions, which makes intention the only direct determinant of behavior [13]. Intention is understood as the attempt to perform a certain behavior. Three determinants exert an influence on intention, namely "attitude toward the behavior" (ATT), a personal and attitudinal factor, "subjective norm" (SN), a social and normative factor, and perceived behavioral control (PBC), a factor that reflects a person's degree of control in performing the behavior [14, 15].

Ajzen and Fishbein [12,16] define attitude towards behavior as a one-dimensional, affective and evaluative concept. Here, a person makes an individual evaluation of the performed behavior or action by reacting approvingly or disapprovingly to this action. The attitude is in turn determined by behavioral beliefs in relation to a specific behavior. These beliefs mark the specific behavior with different attributes, such as characteristics, objects or events [17] (see figure 1).

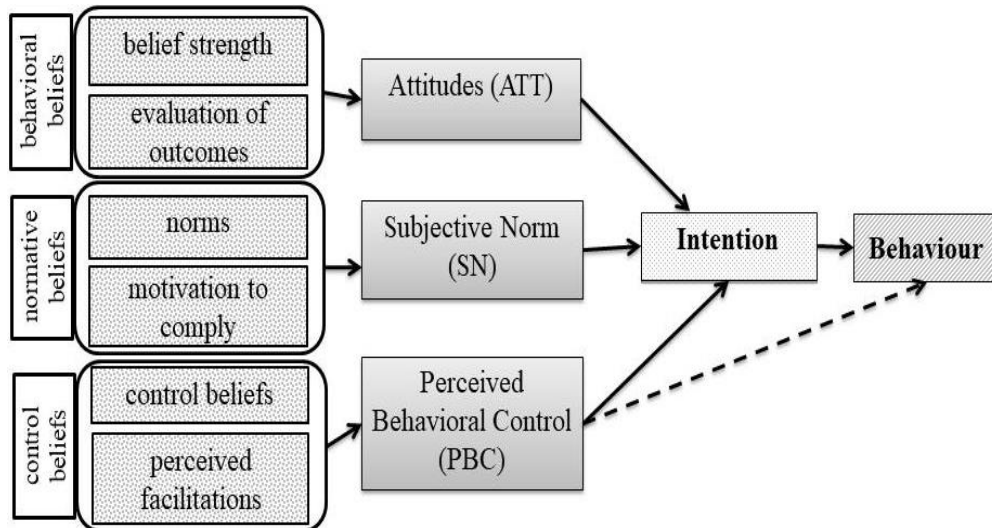


Figure 1: Theory of planned behavior ([15]; modified by authors).

Ajzen [15,18] defines the determinant "subjective norm" as a person's individual perception of social environmental support with regard to the behavior of interest. The subjective norm thus deals with the perceived social consequences of the behavior, whereby these are made up of the expectations of important reference persons and groups of this person. Ajzen and Fishbein [12] write: "It refers to the person's subjective norm, that is, his perception that most people who are important to him think he should or should not perform the behavior in question." (p. 57). These reference groups and persons (family members, friends, etc.) can vary depending on the behavioral situation. The normative beliefs represent a person's perception of the extent to which their relevant reference persons or groups would welcome or reject the performance of the behavior (perception of the expectation of others). For the normative beliefs to become behaviorally effective, the person must also evaluate the extent to which he or she wishes to comply with these expectations of the important attachment figures [14]. Ajzen [15] refer to this second component as motivation to comply. The willingness to comply thus indicates the extent to which a person is motivated to behave in accordance with the presumed wishes of the attachment figures.

Perceived behavioral control describes the extent to which a person perceives the behavior of interest as controllable, or how easy or difficult the person considers it to be to perform the behavior. As with the two previously described components of intention, beliefs form the basis for perceived behavioral control, so-called control beliefs. Control beliefs include all resources (abilities, skills, willpower, information) that a person possesses for the performance of the behavior, as well as the existing restrictions that prevent the performance of the behavior [19]. Many external factors, such as time, opportunity to perform the action, potential situational obstacles or dependence on other people, which may favor the performance of the behavior, can also have a restrictive effect [15]. All of these beliefs or opinions of a person determine the perceived behavioral control. In general, the more resources a person perceives or is able to draw on and the fewer restrictions they believe they have, the more likely it is that the requested behavior will actually be performed [19].

The intention to perform a behavior is greater the more positive the attitude and the more supportive the subjective norm towards the requested behavior is, and also the greater the perceived behavioral control or the stronger the persons are able to control their behavior [15, 18].

### 3. Research Questions and methodology

The main aim of this study is to analyze the determinants of young people's intention to eat sustainably and healthily and to determine the extent to which these determinants impact young people's intention to eat. Three questions are answered in this article:

1. What are the attitudes, subjective norm and perceived behavioral control among young people towards healthy and sustainable eating?
2. Which knowledge do young people have about healthy and sustainable nutrition?
3. What factors influence young people's intention to eat healthily and sustainably?



Fishbein and Ajzen [20] initially assumed that all predictors not included in the theory (TPB) only had an indirect effect on behavior by influencing attitudes or subjective norms or perceived behavioral control. For Ajzen [21], sufficiency therefore means that the predictive power of the TPB cannot be improved by adding further predictors. Many studies have strongly questioned this through their investigations in different behavioral domains. Finally, in 1991, Ajzen [18; also 22] admits that it can make sense to include other factors in the theory if they contribute to the variance explanation of intention or behavior independently of the three predictors already included. In this study, in addition to the intention-determining predictors (ATT, SN, PBC), the influence of knowledge on the intention to eat sustainably and healthily is also examined.

In this study, the focus was placed on knowledge, as many studies have shown that young people only have a low level of knowledge about healthy and sustainable nutrition. However, knowledge is positively associated with a healthy and sustainable diet [23,24,25,26].

Kaiser and Frick [27] distinguish between three forms of knowledge, namely *system knowledge*, *action-related knowledge* and *effectiveness knowledge*. All three types of knowledge or some combinations of them can have a predictive effect on behavior. The differentiation of knowledge increases the degree of specificity in knowledge. *System knowledge* is described by Frick, Kaiser and Wilson [28] in the context of ecological behavior as knowledge about the dynamics of (eco)-systems and knowledge about (environmental) problems. *Action-related knowledge* includes knowledge about possible options for action and provides an assessment of whether corresponding actions can be taken and what "costs" they entail [28]. The *effectiveness knowledge* indicates how effective an option for action can be and whether it is ultimately worthwhile to bear the costs associated with taking action. Therefore, *effectiveness knowledge* describes the potential of a particular action or the relative potential of different actions [27].

A total of 171 students (age  $\bar{x}$ : 17.3; n= 96 ♀/ n =75 ♂) participated in this study and filled in a questionnaire. The collected data were processed in anonymous form in the present study. For data analysis in SPSS mainly correlations und regression analyses were performed. Measurement of behavioral intention, of ATT, SN and PBC follow closely the guidelines recommended by Ajzen [29]. In addition to the constructs of the TPB, subject knowledge on the topic of healthy and sustainable nutrition was operationalized. Two forms of knowledge were operationalized, namely *system knowledge* and *action-related knowledge*. Furthermore, participants were asked to indicate how well informed they were with respect to sustainable und healthy nutrition (*amount of information*). All items are measured via 7-point-Likert scales (e.g. agree-disagree). An overview about scales (factors), item numbers and Cronbach's alpha values of the questionnaire is given in table 1.

Table 1: TPB-factors and model external factors (system knowledge and action-related knowledge).

Factor (number of items)	Example	Cronbach's $\alpha$
Attitude (5)	I think that a healthy and sustainable diet for the foreseeable future is a... (bad/ good)	,855
subjective Norm (4)	Most people who are important to me think that I should eat healthy and sustainably in the next foreseeable future.	,721
perceived behavioral control (5)	For me, a healthy and sustainable diet in the foreseeable future would be... (possible / impossible)	,753
Intention (3)	How likely do you think it is that you will actually eat more healthily and sustainably in the foreseeable future?	,831
Subject knowledge (system-knowledge) (9)	A sustainable eating habits has a positive influence on your own well-being and health.	,816
Subject knowledge (action-related - knowledge) (7)	I am aware of the guidelines and eating recommendations for a sustainable and healthy diet (e.g. increased consumption of vegetables and fruit)	,827
Subject knowledge (amount of information) (2)	I think I know a lot about the topic of "healthy and sustainable nutrition".	,871

## 4 Findings

### **What are the attitudes, subjective norm and perceived behavioral control among young people towards healthy and sustainable eating?**

The adolescents who participated in the survey show a moderate intention to eat healthily and sustainably in the foreseeable future when looking at the 7-level response formats of intention-items. Nevertheless, they tend to have a positive attitude (ATT<sub>mean</sub>=5.38) towards the intention and they tend



to be convinced that they can implement the desired action ( $PBC_{mean}=4.96$ ). SN with a mean value of 3.78 is rather low among the young people (tab. 2).

Table 2: Descriptive statistics.

	N	Mean	SD
ATT	165	5.38	1.11
SN	168	3.78	1.27
PBC	160	4.96	1.09
Intention	168	4.32	1.43

### Which knowledge do young people have about healthy and sustainable nutrition?

The participants estimate their own knowledge (*amount of information*) regarding healthy and sustainable nutrition slightly above the mean (mean=4.80). Nevertheless, this value does not exceed the scale value 5 on the 7-point Likert scale. The young people show the highest value in *system knowledge* (tab. 3). The mean value of the *action-related-knowledge* construct (mean=4.93) is just below 5.

Table 3: Descriptive statistics.

	N	Mean	SD
System-knowledge	156	5.07	1.06
Action-related-knowledge	168	4.93	1.10
amount of information	171	4.80	1.27

### What factors influence young people's intention to eat healthily and sustainably?

In order to identify influential predictors of intention, a hierarchical regression analysis is performed (tab. 4). In the first block, the averaged attitude, subject norm as well as perceived behavioral control are included in the model by using the enter-method. The averaged external model factors as *system-knowledge*, *action-related-knowledge* and *amount of information* are included in the model using the step-wise-method in the second block. Two models are proposed. Table 4 demonstrates results of TPB-model (1 model) and the final model (2 model) or extended model by including model external factors.

Around 53% of the intention to eat healthily and sustainably in the foreseeable future is predicted by the model-internal TPB variables, namely ATT, SN and PBC (tab.4; model 1). The PBC is the strongest predictor ( $b= 0.5$ ;  $p \leq .001$ ), which is followed by ATT ( $b=.268$ ;  $p \leq .001$ ). If model-external factors (*system knowledge*; *action-related-knowledge* and *amount of information*) are simultaneously considered in the model, in addition to the PBC ( $b =.492$ ;  $p =.001$ ) and ATT ( $b=.226$ ;  $p=.001$ ) as well as *amount of information* ( $b =.183$ ;  $p =.006$ ) can be described as influential predictors of intention. Overall, the extended model explains about 55% ( $R^2_{adj.} = .549$ ) of intention (tab. 4). Two factors, namely *system knowledge* and *action-related knowledge*, are not included in the model and are therefore not considered to be formative factors of intention in the context of healthy and sustainable nutrition.

Table 4: Regression on intention. N= sample size;  $R^2$ = goodness of fit [ $R^2_{adj.} = R^2$  adjusted]; F=F-value; T: t-value; b= standardized coefficients (beta); p= significance (2-sided) [\*:  $p \leq .05$ ; \*\*:  $p \leq .01$ ; \*\*\*:  $p \leq .001$ ]

Construct	Regression analysis (N=136)				
	$R^2$	$R^2_{adj.}$	F (ANOVA)	b	T
TPB-model (enter)					
ATT				.268	4.096***
SN				.120	1.967
PBC				.549	8.512***
	.536	.525	50.796***		



<b>extended model (step-wise)</b>					
ATT				.226	3.454***
SN				.112	1.878
PBC				.492	7.456***
amount of information				.183	2.808**
system-knowledge				-	-
action-related knowledge				-	-
	.562	.549	42.056***		

Furthermore, the measured constructs (ATT, SN, PBC, *system-knowledge*, *action-related-knowledge* and *amount of information*) were correlated with the intention to eat healthily and sustainably in the foreseeable future. Table 5 shows the results, which show clearly that ATT ( $r = .479$ ) and PBC ( $r = .683$ ) correlate strongly with intention, while SN ( $r = .196$ ) can be assigned a rather weak correlation. There is also a positive correlation between knowledge and intention: the highest correlation can be assigned to the construct *amount of information* ( $r = .440$ ). *System knowledge* correlates with intention at  $r = .193$ , while *action-related knowledge* correlates at  $r = .286$ .

Table 5: Results of pearson-correlation analysis.  $r$  = pearson correlation coefficient.

	ATT	SN	PBC	Amount of information	System-knowledge	Action-related-knowledge
Intention	$r = .479$ $p < .001$ (N=162)	$r = .196$ $p = .011$ (N=168)	$r = .683$ $p < .001$ (N=158)	$r = .440$ $p < .001$ (N=168)	$r = .193$ $p = .017$ (N=168)	$r = .286$ $p < .001$ (N=153)

## 5. Discussion and conclusion

A healthy and resource-conserving diet is a key factor for future (global) food security. Increasing ecologization of agricultural production has a positive impact on biodiversity and other environmental factors. A plant-based diet is good for health and the climate. In order to make healthy eating more widespread and support ecologically favorable developments in nutrition, people's nutritional competence must be strengthened through targeted communication and nutrition education programs. To this end, it is particularly important to consider formative predictors of intention with regard to the behavior under consideration, as these are key factors that can be addressed in order to raise young people's awareness of sustainable and healthy eating.

The results clearly show that ATT and PBC as well as the construct *amount of information* significantly influence the intention (mean=4.32) to eat healthily and sustainably. Although attitudes (mean=5.38) and perceived behavioral control (mean=4.96) are positive, they are not as high overall when the 7-point Likert scale is considered. The subjective norm is the lowest compared to ATT and PBC. The construct *amount of information* (mean= 4.8) expresses the self-assessment of knowledge regarding healthy and sustainable nutrition, whereby it is clear that this is not rated particularly highly when the 7-point Likert scale is considered. Knowledge of healthy and sustainable nutrition should be expanded among young people through intervention programs so that it becomes behaviorally effective. The results of the correlation analyses also reinforce this demand that knowledge correlates positively and significantly with the intention to eat healthily and sustainably. Further studies [24] have also shown a positive correlation between knowledge as well as healthy and sustainable eating habits, which also confirm the results of this study. Consequently the lack of basic knowledge about nutrition can lead to many misconceptions, which are not limited to issues relating to food composition, but also extend to eating habits (e.g. recommendet portions) [25]. There is also a positive and significant correlation between attitudes and perceived behavioral control and intention. The subjective norm correlates only slightly with the intention, which means that it is not essential to focus on this construct in the intervention programs.

The limitations of the study should be pointed out in the following. The sample size of 171 students is relatively small and the gender distribution is also unbalanced with a preponderance of female participants, which could affect the external validity of the results or the findings. A larger and balanced sample in terms of gender distribution could improve the generalizability of the results. This should be taken into account in a further study. Most of the data is based on self-reported information such as attitudes, subjective norms, perceived behavioral control and knowledge. Self-reported data



may be subject to bias and should be interpreted with caution. In further studies, students could also be asked about measured constructs using qualitative methods (e.g. interviews) in order to ensure the validity of the results. It should also be noted that in further studies, other constructs such as cultural and social aspects should also be considered in addition to TPB constructs and subject knowledge, as these could also influence the intention to eat sustainably. This needs to be examined. However, the aim of this study was to investigate some findings about TPB in the context of sustainable eating among young people.

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