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CONSUMER ATTITUDES TOWARDS PROBIOTIC SUPPLEMENTS

Witold Kozirok

Gdynia Maritime University, Morska 81-87, 81-225 Gdynia, Faculty of Management and Quality Science, ORCID 0000-0003-0829-2733, e-mail: w.kozirok@wzj.UMG.edu.pl

Abstract: The relevance of gut microbiota in a number of physiological and metabolic processes is undisputed. They have an extremely important role in the prevention and treatment of many lifestyle diseases. Modern man suffers from its constant decomposition. Measures to modulate and stabilise the intestinal balance include dietary supplements containing probiotic strains. The aim of the study was to identify attitudes towards probiotic supplements. The study included 234 respondents of varying gender, age, education, frequency of probiotic consumption and self-assessed knowledge of probiotics. A diagnostic survey method was used. Attitudes were identified using a 5-degree Likert scale. The majority of respondents (64%) declared a positive attitude, the remainder were neutral. No negative attitudes were declared. Factors significantly affecting attitude intensity included frequency of probiotic consumption ($p < 0.001$), gender ($p < 0.025$) and declared knowledge ($p < 0.04$). The use of positive attitudes should be considered in health promotion and management.

Keywords: attitudes, supplements, human microbiota, probiotics.

1. INTRODUCTION

In recent decades, interest has increased significantly in the role that gastrointestinal microbiota play in shaping human health, ensuring the proper course of the physiological and metabolic processes, and in explaining the pathophysiological mechanisms of many lifestyle diseases [Jaworski, Dudek and Jurczak 2016; Eberl 2018, Gałecka, Basińska and Bartnicka 2018; Zhang, Ju and Zuo 2018; Cani 2019; Kazimierska and Kinsner 2019]. Numerous studies have provided strong evidence indicating that the quantitative and qualitative nature of the human gut microbiota may be related to the development of many disorders, which has broad preventive implications. In the literature, the term microbiota describes the population of microorganisms that inhabit specific ecosystems. One of the most important ecosystems that strongly determines human health is the gut. The term microbiota is often incorrectly defined as and interchangeably used with the term microbiome, which should be considered a mistake. The latter term does not define a community of living microorganisms residing in a specific ecological niche, but the sum of the genes and genomes of the microorganisms forming the microbiota [Malinowska,

Tokarz-Deptuła and Deptuła 2017; Kazimierska and Kinsner 2019; Panasiuk and Kowalińska 2019]. The microbiota of the gut play an important, if not key, role in digestion and the absorption of nutrients, maintaining the integrity of the intestinal epithelial barrier, ensuring normal physiological processes, synthesis of key vitamins and short-chain fatty acids (SCFAs), protection against pathogens and diseases, mainly of inflammatory and metabolic origin, and finally immunomodulation. Additionally, they regulate intestinal motility, neutralise certain drugs and stimulate and/or inhibit the production of neurotransmitters (e.g. serotonin, dopamine) [Rudzki et al. 2012; Gill et al. 2018; Panasiuk and Kowalińska 2019]. Maintaining the desired composition of the gut microbiota, known as eubiosis, guarantees the proper functioning of the human body on many levels, both somatic and psychological, and is an effective element in the prevention of many diseases. The aetiology of many gastrointestinal, metabolic, allergic, autoimmune, neurodegenerative and even psychiatric and autism spectrum diseases has been linked to disturbances of the gut microbiota [Santocchi et al. 2016; Li et al. 2017; Dworzański et al. 2018; Gulas et al. 2018; Ceppa, Mancini and Tuohy 2019; Hirschberg et al. 2019].

The factors that are most likely to destabilise the qualitative and quantitative composition of the human gut microbiota include pharmacotherapy and, more specifically, the frequent use of antibiotics, steroids, sulfonamides, metformin etc. These drugs are issued only by medical prescription and are therefore intended for restricted and controlled use. However, an extremely worrying and dangerous phenomenon observed in Poland and worldwide is the excessive popularity of medicines dispensed without a doctor's prescription, i.e. OTC (over the counter) drugs [Zimmermann and Michalski 2009; Panasiuk and Kowalińska 2019]. The availability and consequently the scale of OTC drug consumption decimates the gastrointestinal microbiota and destabilises the intestinal balance in their consumers. Thus, there is a violation of the integrity of the intestinal barrier, increased exposure to immunogenic substances, the persistence of chronic subclinical inflammation, and consequently, the initiation of various disease states in the body.

These extremely popular remedies include: (a) agents from the proton pump inhibitor group, designed to neutralise gastric juices and relieve the discomfort associated with heartburn, reflux, indigestion, gastric complaints and (b) non-steroidal anti-inflammatory drugs, commonly used as analgesics [Panasiuk and Kowalińska 2019]. High consumption of these substances is further supported by widespread marketing messages in the media.

Other equally important causes of dysbiosis include improper diet, nutrition and food quality [Hirschberg et al. 2019; Panasiuk and Kowalińska 2019; Stachowska 2021]. The condition of intestinal ecological imbalance (dysbiosis) is reflected in numerous clinical symptoms and requires comprehensive and long-term dietary and behavioural management. Products that belong to the group of so-called functional foods, i.e. probiotic supplements or food for special nutritional or medical purposes, can help. A nutritional impact using fermented products is also possible [Stachowska

2021], but due to the extent of the problem and the nature of this publication, this issue will not be raised here.

2. PROBIOTICS AS A FUNCTIONAL FOOD

The category of ‘functional food’, which exists in the literature as well as in common parlance, is underdefined and gives rise to much debate in this area. This is mainly due to the lack of an unambiguous definition and thus a great deal of discretion in the interpretation and qualification of this food group. Work on the development of such a definition has been going on since the 1980s, but it has not been possible to classify this group of food products within a coherent definition framework. This discussion assumes that functional food is a type of food that has a documented positive effect on one or more bodily functions over and above the nutritional effect resulting from its content of nutrients considered as essential. This functionality is due to its impact on improving health and well-being as well as reducing disease risk [Gawęcki and Mossor-Pietraszewska 2006]. These conditions are met partly by foods containing probiotics, i.e. selected microorganisms that exert a beneficial health effect in the host organism. They are also present in supplement preparations or foodstuffs for particular nutritional or medical uses. Only a few probiotics are registered as medicinal products. Supplement formulations may contain one or more selected microbial strains. In the selection process, probiotic strains must meet both safety and functional criteria, as well as criteria related to technological suitability. Probiotics should have proven health effects consistent with the characteristics attributed to the strain [Panasiuk and Kowalińska 2019].

Probiotic microorganisms include mainly lactic acid-producing bacteria of the *Lactobacillus* and *Bifidobacterium genera* and *Saccharomyces boulardii* fungi. *Lactobacillus* and *Bifidobacteria* are responsible for the intestinal synthesis of vitamins (B₁, B₂, PP, H, B₁₂, K, B₉); *Bifidobacteria* contribute to an increase in the expression of genes coding for tight junction proteins between enterocytes, while *Lactobacilli* influence the reduction of visceral fat and the size of adipocytes. The most thoroughly studied probiotic strain in the world is *Lactobacillus rhamnosus* GG ATCC 53103 (GG), followed by *Streptococcus thermophilus* and *Bifidobacterium lactis*. *Bacillus* spp, some strains of *Escherichia coli* (*E. coli* Nissle 1917), *Lactococcus*, *Streptococcus*, *Enterococcus*, *Leuconostoc*, or *Propionibacterium* are also used as probiotics. The beneficial health effect of probiotics is based on the restoration of a natural and properly functioning microbial system in the ecological niche of the intestines.

The effect of probiotics on human health is multidirectional and involves many organs and systems. Although there are many of them, it is worth mentioning those related to the digestive tract, which by colonising the intestinal epithelium and mucosa prevent pathogen adhesion and invasion, modulate the immune response by

interacting with the immune system of the gastrointestinal tract, produce SCFAs showing a trophic effect on the intestinal epithelium, influence the increased exchange of enterocytes, contribute to the reconstruction of the intestinal squamous epithelium and maintain its integrity, participate in the synthesis of digestive enzymes, stimulate colonic peristalsis, counteract intestinal disorders, and promote the remission of inflammatory bowel diseases. In addition to their direct effects on the gastrointestinal tract, probiotic strains also play a role in stimulating gut-brain communication. Selected strains of probiotics produce specific bioactive substances, exhibit endocrine and neurogenic, hypolipemic, anti-allergic, anticancer and immunosuppressive effects. Additionally, probiotics may stimulate the phagocytosis of pathogens and reduce inflammation in the system. They contribute to the prevention of cancer and metabolic, bone, cardiovascular, neurodegenerative and mental diseases [Ebel et al. 2014; Mojka 2014; McCabe, Britton and Parameswaran 2015; Tokarz-Deptuła et al. 2015; Sáez-Lara et al. 2016; Sánchez et al. 2017; Eberl 2018; Gill et al. 2018; Janczy 2019; Kazemi et al. 2019].

3. THEORY OF ATTITUDES

Attitudes are one of the most important psychological factors determining shopping behaviour and consequently eating behaviour. Identification of attitudes towards a specific object creates conditions for modification of these attitudes, enables determination of subsequent behaviour and clarifies the reasons for one and not another behaviour [Babicz-Zielinska and Zabrocki 2007]. There are many definitions of attitudes in social sciences, and this diversity is conditioned by the adopted concept, which can be either cognitive or behavioural. The study described here used the behavioural concept. This approach focuses on human behaviour and is mainly concerned with that which is repeated in certain situations or in relation to a certain object. Undoubtedly, shopping behaviours as well as eating behaviours are of this type. In this view, attitude is a type of disposition to behave in a certain way.

This study assumes that attitude is a relatively permanent structure of the cognitive and emotional processes and behavioural tendencies, in which a certain outlook towards a given object or a disposition to such a structure is expressed [Mika 1984]. Attitude consists of cognitive, affective and behavioural components. The cognitive component relates to knowledge of the attitude object and the memory of connotation towards it. In this sense, an attitude is an opinion relating to reality that does not necessarily produce a feeling of repulsion or attraction. Emotions are one of the basic regulators of human behaviour, and when they are triggered they contribute to the formation of attitudes towards an object or phenomenon. A person tends to gravitate towards something that triggers positive emotions and avoids things that trigger negative emotions. One could argue that the formation of attitudes

starts with emotions. It is therefore the affective factor that determines the feeling of attraction or repulsion.

The attitude object can trigger different emotions and in different strengths. It is this dimension of attitude that describes its intensity and strongly determines its type. The behavioural component, on the other hand, should be the disposition to act in relation to the attitude object. This component may induce the individual to one of two courses of action: approaching the attitude object or avoiding it [Jeżewska-Zychowicz and Pilska 2008]. Attitudes range between two extremes: positive and negative [Babicz-Zielińska and Zabrocki 2007]. When an individual displays a partly positive and partly negative attitude towards an object, the attitude is classified as neutral. Some describe this state as an ambivalent or neutral attitude. Indifference towards a particular object of interest is a fairly common scenario. This is because individuals tend to recognise both the advantages and disadvantages of the attitude object, which involves feeling positive and negative emotions at the same time. Indifference intensifies when there is a conflict, for example curiosity versus anxiety/fear, pleasure/fashion versus health.

It should be mentioned that attitude is a very personal thing and exists within the human psyche. The relationship between attitude and behaviour is not necessarily obvious. A positive or negative attitude does not have to translate directly into particular behaviours, but it may indeed encourage them. The inconsistency in consumer attitudes and behaviours has been described many times in the literature [Jeżewska-Zychowicz and Pilska 2007; Kozirok 2017]. An attempt to explain the relationship between attitudes and behaviour has been made by Ajzen in his theory of planned behaviour. In this model, the factors influencing behaviour are intentions, attitudes toward the behaviour, subjective norms, and the sense of having control over the behaviour [Ajzen 2015].

4. MATERIAL AND METHODS

The study was conducted by a diagnostic survey method based on a questionnaire. It consisted of a general section and a section describing the descriptive characteristics (sociodemographic profile) of the respondents. The survey was multifaceted and included consumer behaviours and attitudes towards products that could influence the composition of the human gastrointestinal microbiota. This study focused solely on the identification and analysis of attitudes towards probiotic supplements. The surveys were conducted during a pandemic using on-line tools via a web-based platform. The study group was selected at random and included 234 individuals of varying gender, age (25–65 years) and education.

The characteristics of the study group are shown in Table 1.

Table 1. Sociodemographic profile of the study population, included the frequency of consumption probiotic supplements [%]

| Criterion | | n | [%] | Frequency of use of supplementation | | | | χ^2 |
|-------------------|-------------|-----|------|-------------------------------------|-------------|--------------|------------|--------------|
| | | | | Definitely do not use | Very rarely | Occasionally | Very often | |
| | | | | [%] | | | | |
| TOTAL | | 234 | 100 | 26.5 | 32.9 | 29.9 | 10.7 | |
| Gender | Woman | 143 | 61.1 | 19.6 | 32.9 | 33.6 | 14 | 0.007 |
| | Man | 91 | 38.9 | 37.3 | 33.0 | 24.2 | 5.5 | |
| Age | 25–40 years | 78 | 33.3 | 28.2 | 28.2 | 26.9 | 16.7 | 0.09 |
| | 41–50 years | 84 | 35.9 | 20.2 | 42.9 | 28.6 | 8.3 | |
| | 51–65 years | 72 | 30.8 | 32.0 | 26.4 | 34.7 | 6.9 | |
| Educational level | ≤ Secondary | 76 | 32.5 | 26.3 | 44.8 | 19.7 | 9.2 | 0.02 |
| | Higher | 158 | 67.5 | 26.6 | 27.2 | 34.8 | 11.4 | |

Source: own study.

To identify attitudes towards probiotic supplements, a 5-point Likert scale with 8 statements was used, some of which were modelled and adapted from a scale for studying attitudes towards functional foods [Urala and Lähteenmäki 2004]. Response options ranging from ‘strongly disagree’ to ‘strongly agree’ were used. The responses were quantified by assigning numerical values to specific scale levels reflecting the increasing intensity of the feature, from 1 for total rejection (strongly disagree) to 5 for total acceptance (strongly agree). The scale used was an unforced scale with a neutral range (3 points). Negative statements were recoded, i.e. the scoring for each answer was reversed, with 1 point for ‘strongly agree’ and 5 points for ‘strongly disagree’. A higher score indicated a more positive attitude towards the attitude object.

Based on the sum of the scores, respondents with negative, neutral and positive attitudes were selected. The division criterion was 1/3 and 2/3 of the point range. Numerical ranges were established to describe specific attitudes: negative – <1.00–2.33>; neutral – <2.34–3.66>; positive – <3.67–5.00>.

The analysis of the results was performed taking into account the following criteria: gender, age, declaration of probiotic supplement consumption frequency, education and self-assessed level of knowledge about probiotics. Statistical analysis of the empirical material was performed based on the χ^2 test assuming the significance level of $p \leq 0.05$.

5. RESULTS

Consumer attitudes towards a particular object are a major factor in shaping consumer behaviour. Attitude identification not only provides opportunities to shape and influence consumer behaviour, but it can also be used as a tool to enable management processes. As far as the object of interest described in this publication is concerned, both product management (dietary supplements) and public health management might be involved. All three components of attitudes can be shaped by influencing specific product features and characteristics, marketing campaigns and education. Advertisements as well as educational campaigns significantly improve consumer awareness of functional foods. However, attitudes towards such foods need to be monitored to ensure that the products meet consumer expectations, trigger positive emotions and allow consumers to enjoy the benefits associated with the product [Urala and Lähteenmäki 2007]. For many years there has been a strong emphasis on promoting a healthy lifestyle. Health for a large part of the population, mainly the elderly, is a paramount value and a matter of great concern. This concern is very often the trigger for strong emotions, which are considered an important determinant in shaping attitudes. These in turn may translate into or incline toward specific behaviours. Being aware of the problem of high morbidity and incidence rates of civilisation diseases, it would seem appropriate to undertake all preventive actions and to support therapeutic processes which are directly included in the process of health management, from both the individual and global, i.e. public, perspective. A certain product has been developed in recognition of the importance of disturbed gastrointestinal microbiota in the etiopathogenesis of many diseases and the factors that disrupt its balance to provide a real opportunity to restore or maintain this balance. Dietary supplements containing probiotics or synbiotics seem to be a very reasonable solution, especially considering the widespread consumption of substances that cause the decomposition of the gastrointestinal microbiota. The issue of the enormous popularity of dietary supplements raises many legitimate doubts and controversies, but in the case of dietary supplements containing, among other things, vitamin D, folic acid, or probiotic strains, it seems to be fully justified and desirable. The aim of this study was to identify attitudes towards probiotic supplements.

The obtained data clearly indicated that positive attitudes towards probiotic dietary supplements dominated in the study group. Such an unequivocal statement when identifying attitudes towards different foods does not happen often. Most of the published studies are dominated by neutral attitudes with an outlined tendency towards positive or negative attitudes. The assumed cut-off point for positive attitude was 3.66. The analysis of the entire study sample showed that the mean value for all study participants was 3.85, and thus they declared a positive attitude (Tab. 2, Fig. 1). None of the respondents declared a negative attitude. The group of people declaring a positive attitude accounted for 64% of the respondents, while those declaring an neutral attitude were only 36%.

Table 2. Consumer attitudes towards probiotic supplements

| Statement * | Total | Gender | | Education | | Age (years) | | | Frequency rate of supplementation | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------------------------------|-------------|--------------|-------------|
| | | Women | Men | ≤ Secondary | Higher | 25-40 | 41-50 | 51-65 | Definitely do not use | Very rarely | Occasionally | Very often |
| 1 | 4.33 | 4.50 | 4.05 | 4.09 | 4.44 | 4.24 | 4.37 | 4.38 | 3.87 | 4.29 | 4.61 | 4.80 |
| 2 | 3.21 | 3.45 | 2.85 | 3.30 | 3.17 | 3.05 | 3.37 | 3.21 | 2.58 | 3.17 | 3.44 | 4.28 |
| 3 | 3.30 | 3.51 | 2.98 | 3.09 | 3.41 | 3.40 | 3.33 | 3.17 | 2.66 | 3.16 | 3.60 | 4.52 |
| 4 | 3.82 | 3.93 | 3.65 | 3.75 | 3.85 | 4.00 | 3.83 | 3.61 | 3.53 | 3.82 | 3.80 | 4.60 |
| 5 | 3.81 | 4.03 | 3.45 | 3.71 | 3.84 | 3.85 | 3.73 | 3.86 | 3.42 | 3.57 | 4.16 | 4.52 |
| 6 | 3.84 | 4.06 | 3.48 | 3.70 | 3.91 | 4.09 | 3.93 | 3.46 | 3.31 | 3.62 | 4.26 | 4.64 |
| 7 | 3.88 | 4.01 | 3.66 | 3.64 | 3.99 | 3.96 | 3.85 | 3.82 | 3.47 | 3.71 | 4.13 | 4.68 |
| 8 | 4.60 | 4.55 | 3.69 | 4.61 | 4.60 | 4.44 | 4.61 | 4.78 | 4.71 | 4.61 | 4.67 | 4.12 |
| \bar{x} | 3.85 | 4.01 | 3.60 | 3.74 | 3.90 | 3.88 | 3.88 | 3.78 | 3.44 | 3.74 | 4.08 | 4.52 |

Attitudes: – neutra – positive

* **1.** Probiotics have healthy and preventive properties; **2.** The diet should include the consumption of dietary supplements containing probiotics; **3.** The effect of probiotic supplements on digestive function and health is overrated; **4.** The safety of consuming probiotic supplements is questionable; **5.** Eating behaviour does not use the potential of probiotic supplements; **6.** Probiotics are an incomprehensible invention of the pharmaceutical industry; **7.** The use of probiotic supplements positively influences the composition of the intestinal bacterial flora; **8.** Silage and fermented products are better than probiotic supplements.

Source: own study.

Using different criteria for the division of the study group, subpopulations were distinguished based on gender, education level, age and frequency of probiotic supplementation use. An analysis of each of these subgroups showed that neutral attitudes were identified in the case of men and those declaring that they had never used such foods. The strongest positive attitudes were declared by women ($\bar{x} = 4.01$) and people who consumed probiotic dietary supplements occasionally ($\bar{x} = 4.08$), especially those who used them very often ($\bar{x} = 4.52$). The distribution of the results showed the consistency of the declared attitudes with the behaviours expressed in the frequency of consumption of this group of supplements. This relationship was very clearly outlined and statistical analysis of the distribution of these results indicated high significance ($p < 0.001$). In this case, a proportionality of the intensity of the positive attitude as a function of the frequency of use of this group of supplements could be observed. Thus, it can be assumed that the declared attitudes determined the frequency of probiotic consumption.

Figure 1 provides a graphical interpretation of the distribution of the results obtained to visualise the main trends. Individuals exhibiting positive attitudes were

primarily very frequent dietary supplement users, and women. It should be added that the group most likely to consume probiotic supplements included mostly women. Many studies have shown that care for health is a distinctive feature of women, while men do not attach such importance to it [Babicz-Zielińska 2010; Kozirok, Baumgart and Babicz-Zielińska 2012; Czapinski and Panek 2015; Zabrocki and Suszek 2018; Bakshi, Chhabra and Kaur 2020]. At the same time it was shown that both gender and frequency of consumption of dietary supplements significantly differentiated consumer attitudes in these groups ($p < 0.05$). On the other hand, age and education level did not influence the nature of the declared attitudes ($p > 0.05$).

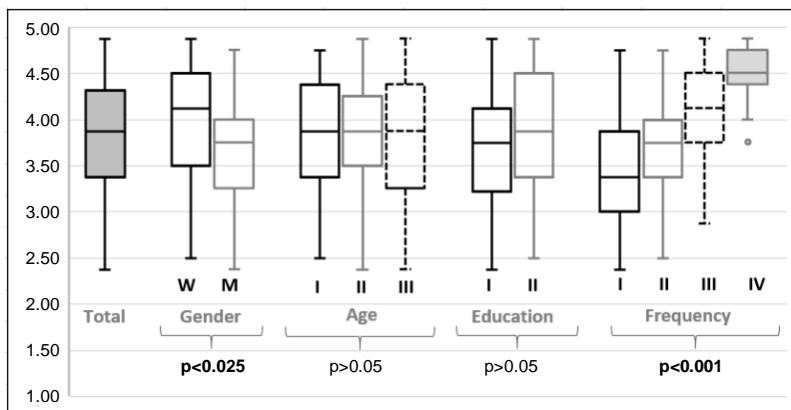


Fig. 1. Distribution of attitudes towards probiotic supplements in study groups

* **W:** Women; **M:** Men; **Age I:** 25–40 years; **II:** 41–50 years; **III:** 51–65 years; **Education I:** ≤ Secondary; **II:** Higher; **Frequency I:** Definitely do not use, **II:** Very rarely, **III:** Occasionally, **IV:** Very often

Source: own study.

Despite the lack of significant differences in these separate groups, it is worth noting the outlined trends. In the mixed age group, the distribution of results was very similar; a higher concentration of obtained declarations was seen only in the group aged 41–50 years. In addition, it was found that among the oldest respondents (> 50 years), the intensity of a positive attitude was slightly lower than among the younger study participants. However, this difference was not statistically significant. This may be due to a lack of belief in these foods in this participant group. For these people, the form of application of probiotic supplements (tablets, sachets) may be associated with a medicinal process. It is important to remember that the elderly take many different medications on a daily basis, and the addition of each additional pill may cause anxiety and negative emotions. On the other hand, it may be assumed that these fears result from their inner conviction about the possibility of interactions with the drugs they take. The issue of the relatively high price of this segment of dietary supplements may also be important, as indicated by Zabrocki and Suszek (2018).

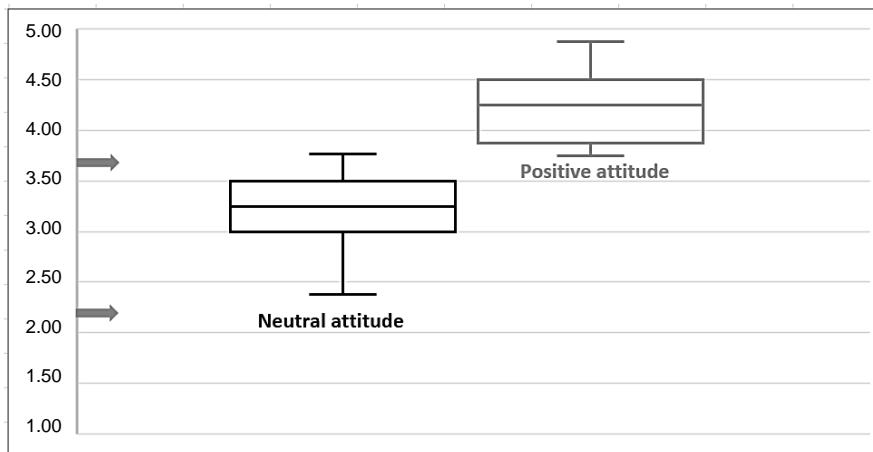
Another group consisted of respondents with varying levels of education. In this case, there were no statistically significant differences in the distribution of attitude scores. However, it was found that people with higher education more often declared positive attitudes ($\bar{x} = 3.90$) compared to people with secondary or vocational education ($\bar{x} = 3.74$). The intensity of this attitude was also higher in the higher education group (Fig. 1). It was somewhat surprising that in relation to statement 8 the respondents expressed the belief that they could hardly see any possibility of making qualitative and quantitative modifications to their gut microbiota by using silages and other fermented products (dairy and/or fruit and vegetables). This is valuable information as it suggests that consumer attitudes towards probiotic supplements are much better than towards natural sources of probiotics.

Thus, education on the role of natural fermented products in shaping the gut microbiota, and indirectly health, is worth including in the public health management process. The role of natural products such as silages, fermented milk beverages, and fermented vegetable beverages in modifying the gut microbiota cannot be overestimated and has been extensively studied and described [Zhang, Ju and Zuo 2018; Stachowska 2021].

Measures should therefore be taken to encourage positive attitudes towards this group of foodstuffs. With proper promotion, the use of probiotic bacteria as an ingredient in a wide range of food products would increase the value of this food category and would be well received by consumers [Bruhn et al. 2002].

While performing an additional analysis of the obtained results, it was decided that the respondents' self-assessed knowledge concerning probiotics from food and supplementary formulations should be taken into account. Five groups were distinguished on the basis of respondents' declarations: people with very high, high, moderate and minimum knowledge and people who said they were not interested at all. The obtained mean values describing the attitude for each group were at the following respective levels: 3.68; 3.80; 3.97; 4.06; and 3.71. This led to the conclusion that as self-assessed knowledge about probiotics increased, the value indicating the intensity of the positive attitude also increased. Statistical analysis of all declarations showed that self-assessed knowledge about probiotics significantly differentiated the intensity of the declared positive attitude ($p = 0.37$).

When analysing the results obtained, it was decided that the distribution of results for each of the declared attitudes should be presented separately (Fig. 2). It shows that the distributions of results concerning the declaration of positive and neutral attitudes almost did not overlap. Thus, a clear separation and strongly delineated differences can be identified. It should also be mentioned that the obtained distribution of results indicating an neutral attitude showed a clear tendency towards a positive attitude (Fig. 2).

**Fig. 2.** Distribution of results for separates attitudes

Source: own study.

Research on attitudes, in the context of predicting behaviours, has been conducted for more than several decades. However, an analysis of the literature in this area reveals numerous errors, disorder and a lack of understanding of the nature of attitude identification. Authors of studies where the title indicates the identification and analysis of attitudes often make numerous mistakes in this field. Attitudes are very often equated with opinions, views, knowledge, or even behaviours regarding the attitude object being analysed, which prevents a proper discussion of the results. The diversity of tools and scales used to identify attitudes must also be taken into consideration. The most commonly used are ordinal scales, e.g. Likert scale, but completely different methods such as FGI (Focus Group Interview) are also used [Bruhn et al. 2002].

It is widely believed that consumers have a positive attitude towards the purchase and consumption of functional foods, which was also confirmed in this study. Literature sources indicate that consumers are even willing to pay more for foods that will allow them to gain benefits [Bakshi et al. 2020]. The willingness to use functional foods is largely influenced by the expectations of beneficial effects. Interest in functional foods also depends on the demographic structure, education and gender. Openness towards functional foods is characteristic of older, educated people and women. This may be due, among other things, to the lack of incidence of health problems among young people. At the same time, it is noted that this food category is heterogeneous and can mean different types of food products in different segments. Therefore, factors influencing attitude may vary from food to food [Bakshi, Chhabra and Kaur 2020]. In the present research, the subject of interest was quite precisely defined, which also made it possible to obtain fairly unambiguous and undoubted declarations of the respondents.

In a study on the identification of consumer attitudes towards health-promoting foods, which used the scale developed by Roininen and Tuorila (1999), it was shown that in the surveyed group of respondents the attitude was mainly neutral and to a lesser extent positive. The distribution of the results of respondents declaring neutral attitudes indicated a clear trend towards positive attitudes. The intensity of the positive attitude increased with the level of education and depended on the gender of the respondents. As in the present study, women were more likely to declare a positive attitudes or show a tendency towards such attitudes [Kozirok, Baumgart and Babicz-Zielińska 2012].

Other studies by the same team using modifications of Roininen and Tuorila (1999) and Urala and Lähteenmäki (2004) scales conducted in a group of women only also showed a dominant neutral attitude with a strong tendency towards positive attitudes [Kozirok, Marcisiewicz and Babicz-Zielińska 2016]. Research conducted in the group of seniors aged 60+ showed that this group declared positive and neutral attitudes. The surveyed seniors, despite their positive attitudes towards functional foods, purchased them rarely, and a significant barrier to purchasing functional foods was that the price was too high [Zabrocki and Suszek 2018]. In contrast, the focus group methods used also indicated positive attitudes towards functional foods containing probiotic strains, but highlighted the fact that some people need to be strongly convinced of the health-promoting properties of such strains [Bruhn et al. 2002].

6. CONCLUSIONS

The analysis of the collected data enabled the identification of consumer attitudes towards probiotic supplements. The results obtained have led to the following concluding statements. In the study group, attitudes towards probiotic supplements were mainly positive (64% of the respondents), with a relatively small proportion of neutral attitudes (36%). No negative attitudes were declared.

Factors significantly affecting attitude intensity in the study group included the frequency of probiotic consumption ($p < 0.001$), gender ($p < 0.025$) and declared knowledge about probiotics ($p < 0.04$). The obtained insight into attitudes towards probiotics suggests a potential for increases in the consumption of these foods, especially under conditions of adverse effects by various factors on the qualitative and quantitative nature of the gut microbiota. This is extremely important in the context of the widespread consumption of antibiotics, non-steroidal anti-inflammatory drugs (e.g. those containing ibuprofen) and proton pump inhibitors. The influence of the diet on the decomposition of the gut microbiota, on the one hand, and its contribution to the microbiota modulation processes, on the other, should also be taken into account.

It would be advisable to use the knowledge of the composition and influence of probiotic strains contained in supplementary formulations on human health in the process of health management both at the individual and public level. The demonstrated positive attitudes towards this group of products create good conditions for the dissemination of this form of dietary intervention. To complement this form of health management, perhaps consideration should be given to educating the public on the effectiveness of using natural sources of probiotic strains (e.g. silage).

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