



## Probiotics and Synbiotics: The Consumers Perspective

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## **Abstract**

**Background:** Probiotics and synbiotics are non-prescription products frequently used by consumers. However, little is publicly known about customers' product usage and knowledge, and the drivers influencing intake initiation and product selection.

**Objectives:** A survey among Polish customers was performed to evaluate their behavior in regard to intake initiation, administration, product selection, knowledge and efficacy experience.

**Material and Methods:** Net promoter scores (NPS) were determined for subsets of consumers. A majority of consumers initiate intake because of specific medical needs and recommendation by a physician.

**Results:** Application of several individual treatment courses per year is not uncommon and treatment lengths range from about a week to daily intake. Product selection is driven by own past experience, physician recommendation, and to a lesser extent pharmacist recommendation. Consumers' knowledge about relevant product features is limited. Nearly half of study participants experienced positive effects after administration of probiotics or synbiotics. Good consumer experience correlates with high NPS-values. Results from the study show that physicians and to a lesser extent pharmacists can play an important role in guiding consumers towards a rational usage and selection of probiotics and synbiotics.

**Conclusions:** Communication between doctors and patients should focus on the efficacy of product features, as supported by scientific data.

**Key words:** colonization resistance, consumer survey, gut microbiota, probiotics, synbiotics, net promoter score, physician recommendation

## Introduction

During recent years, the human gut microbiota (microorganisms living in the human gut) has been identified as an important factor contributing to human health [1, 2]. The role of the gut microbiota includes supporting food digestion, producing certain vitamins, and supplying epithelial cells of the gut with short chain fatty acids, as well as regulating maturation and functioning of the immune system [3, 4, 5, 6]. A diverse and balanced gut microbiota provides so-called colonization resistance, by which an uncontrolled proliferation of pathogenic microorganisms present in the gut is limited by the orchestrated actions of the numerous commensal bacteria present in the gut [7].

Supporting the functionality of the gut microbiota by administration of products containing probiotic microorganisms has become increasingly popular among consumers despite the fact that few health claims of these products have been confirmed by clinical studies [8, 9]. While hard evidence for clinical efficacy is still limited, there is accumulating evidence that products from this category are mainly safe and can be administered without major risks, even over longer time periods [10].

Based on the current scientific data available, it can be concluded that certain features of products containing probiotic microorganisms are generally beneficial. Among these features four can be identified as of especial importance. (1) As the gut microbiota is mainly a community of bacteria, products containing probiotic bacteria can be considered as more preferable than products making use of probiotic yeasts [11, 12]. (2) An important challenge of an intervention of orally administered living bacteria is the passage through the upper part of the digestive tract, especially the transfer through the stomach, where bacteria are exposed to the harsh environment of low pH. Protecting the probiotic bacteria against inactivation by stomach acid has therefore been identified as an essential and positive product feature [15, 14]. (3) Activities of the gut microbiota result from the activities of many commensal bacteria acting synergistically [15]. Theoretically and partially confirmed in preclinical and clinical studies, products containing a variety of different probiotic bacteria (multistrain products) should therefore exhibit

better effects compared to monostrain products [16, 17]. (4) As therapy with probiotics or synbiotics aims to support the gut microbiota by administration of proliferating bacteria, adding a source of energy for the bacteria is a rational approach. Consequently, most modern products are synbiotics containing in addition to the probiotic component(s) a prebiotic component e.g., fructooligosaccharides, which serves as a source of energy for the bacteria [18].

Most of the commercial probiotics and synbiotics are food supplements and the few medical products are over-the-counter pharmaceuticals, both of which can be purchased by customers without a prescription from a physician. In addition, customers have to pay for this kind of product out of their own pocket, as the category lacks any coverage from insurance companies.

The last 20 years has seen a strong increase in the number scientific publications related to probiotics and synbiotics (Figure 1). At the same time, little information is publicly available about consumers behavior related to this kind of product. Producers of products falling into this category most likely have a lot of information about the users of their products; however, they are notoriously reticent to make this knowledge available outside of their particular organizations. The present study addresses this shortcoming by investigating consumers' behavior in Poland through a questionnaire-based survey and making the insights broadly available. For the present study a questionnaire comprising 17 questions was compiled. The questions covered the following areas: (i) study participants' characteristics, (ii) drivers of initiation and usage of products, (iii) drivers relevant for product selection, (iv) knowledge of product category, (v) consumers' experience and (vi) willingness to recommend this kind of product to others.

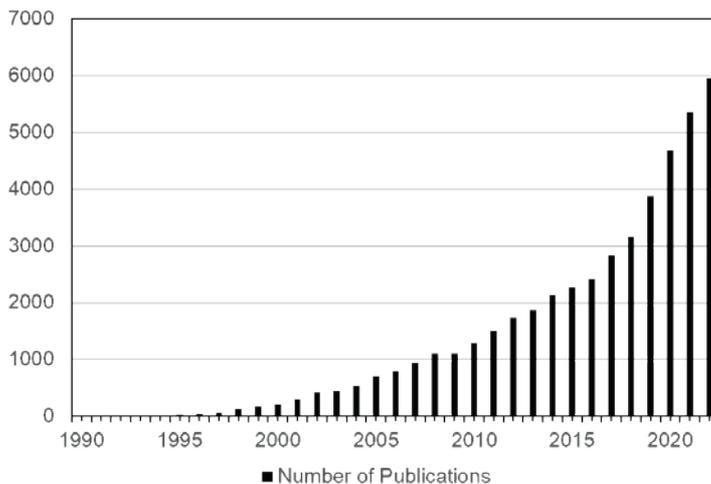


Figure 1. Publications per year from 1990 to 2022 found in PubMed when searching for the keywords “probiotics” or “synbiotics”

Data from the present study will allow healthcare providers (e.g., physicians, pharmacists) to better understand their role in guiding consumers towards a rational usage and selection of probiotics and synbiotics. In addition, the study results will allow professionals to focus during their communication with consumers on those areas that have been identified as information gaps at the consumer level.

## Materials and Methods

### Questionnaire

The team of authors began by proposing a longer list of questions from which the final set of questions was selected; this allowed them to investigate the six areas of interest described in the introduction (see above). To allow study participants to quickly answer the questions, a set of answers was provided for each question. Only for one question (Q5: What are the medical/health reasons making you take a probiotic or synbiotic) was a field for free text input provided in addition to the predefined answers. This approach

allowed study participants to answer all questions in less than five minutes, something which was considered important for achieving a high responder rate for the survey. Testing the final version of the questionnaire using the MonkeySurvey online tool revealed that answering the questionnaire would take on average about 3 minutes.

### **Survey**

Answers were collected through the SurveyMonkey electronic survey system and through paper questionnaires. For the online data collection an electronic link for the questionnaire was sent via e-mail. E-mail addresses were taken from a database, established by Calisia University, comprising the addresses of people who agreed to be contacted for this kind of research. One week after the initial e-mail, a reminder e-mail was sent with the aim of improving the responder rate. In addition, patients in the waiting rooms of general physician clinics were invited to participate in the survey. Patients who agreed to participate were asked to fill in a paper version of the questionnaire. Responses from the electronic survey and the paper survey were merged in an electronic database using Microsoft Excel. Summary statistics and charts were also created in Microsoft Excel.

### **Calculation of net promoter score**

The net promoter score was determined by asking study participants how likely it was that they would recommend probiotics or synbiotics to other people using a scale of 1 (highly unlikely) to 10 (highly likely) [19]. For establishing the net promoter score the number of promoters (those stating 9 or 10 on the scale) and detractors (those stating 1–6 on the scale) were determined. The net promoter scale was then calculated by using the formula:

$$\text{NPS} = \text{promoters (as \% of all responders)} - \text{detractors (as \% of all responders)}$$

Net promoter scores of subsets of responders were calculated by selecting datasets for the respective subsets.

## Results

A total of 3,200 people were invited to participate in the survey and 622 responses to the questionnaire were collected between May and June 2023. Each question was answered by a varying number of responders. For most of the questions at least 97% of study participants provided an answer. Answering rates to the questions about the length of intake duration and about the product selection reasons were a little lower, with 94.2% and 96.8%, respectively.

### Characteristics of participating responders (Q1–Q4)

The characteristics of participants are shown in table 1. Nearly two thirds of all responders were female. The average age of a responder was 42.6 years. The percentage of participants who lived in urban locations was 63.9, whilst 36.1% lived in rural locations. The majority of study participants had either a secondary or a higher educational background.

Table 1. Demographic characteristics of survey participants

| Participation characteristic (number of responders) | Number | Proportion of overall respondents |
|---|--------|-----------------------------------|
| <b>Gender</b> (622)                                 |        |                                   |
| female  | 398    | 64.0%                             |
| male  | 224    | 36.0%                             |
| <b>Age</b> (621)                                    |        |                                   |
| <20   | 10     | 1.6%                              |
| 20–29   | 126    | 20.3%                             |
| 30–39   | 140    | 22.5%                             |
| 40–49   | 159    | 25.6%                             |
| 50–59   | 102    | 16.4%                             |
| 60–69   | 45     | 7.2%                              |
| ≥70   | 40     | 6.4%                              |
| <b>Place of residence</b> (621)                     |        |                                   |
| rural   | 224    | 36.1%                             |
| urban   | 397    | 63.9%                             |

| Participation characteristic (number of responders) | Number | Proportion of overall respondents |
|---|--------|-----------------------------------|
| <b>Education (621)</b>                              |        |                                   |
| elementary  | 70     | 11.3%                             |
| secondary   | 215    | 34.6%                             |
| higher  | 238    | 38.3%                             |
| higher with degree                                  | 93     | 15.8%                             |

### Initiation and usage of probiotics or synbiotics (Q5–Q8)

#### *Medical or health reasons for taking probiotics or synbiotics (Q5)*

When asked for the reason why they were taking a probiotic or synbiotic, more than half of the study participants (56.0%) answered that they were using this kind of product in “combination with antibiotics” (Figure 2). Gastrointestinal problems (e.g., diarrhea or constipation) were also important triggers to initiate intake. About 5% of responders stated that they were using products of this category for the treatment of irritable bowel syndrome (IBS). Among other reasons to take these products were mycotic infections and skin problems (e.g., acne).

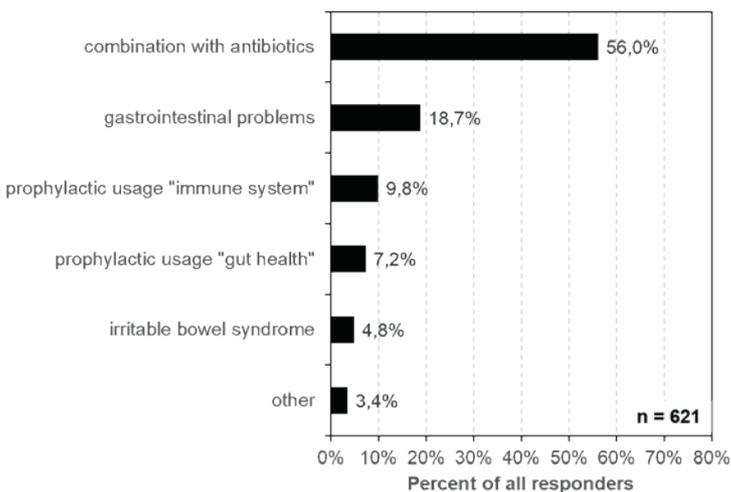


Figure 2. Medical or health issues prompting responders to take probiotics or synbiotics

**Role of past experience or recommendations in taking probiotics or synbiotics (Q6)**

For nearly three out of ten survey participants the administration of probiotics or synbiotics was driven by their past experience with this kind of product (Figure 3). More than half of the responders (53.5%) stated that the intake was recommended by a physician. Pharmacists, family and friends and advertisements were mentioned as less important intake triggers.

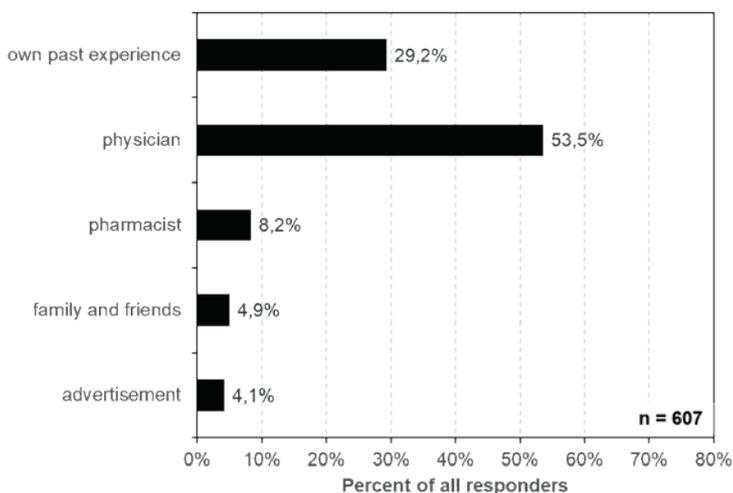


Figure 3. Role of past experience and recommendations as drivers to use probiotics or synbiotics

**Number of treatment courses during the past year (Q7)**

Nearly three quarters (74.3%) of all survey participants stated that they had used probiotics or synbiotics during the past year (Figure 4). Most of those who had used products from the category during the past year had administered one to three individual treatment courses. Nearly one fifth of responders had administered more than three treatment cycles.

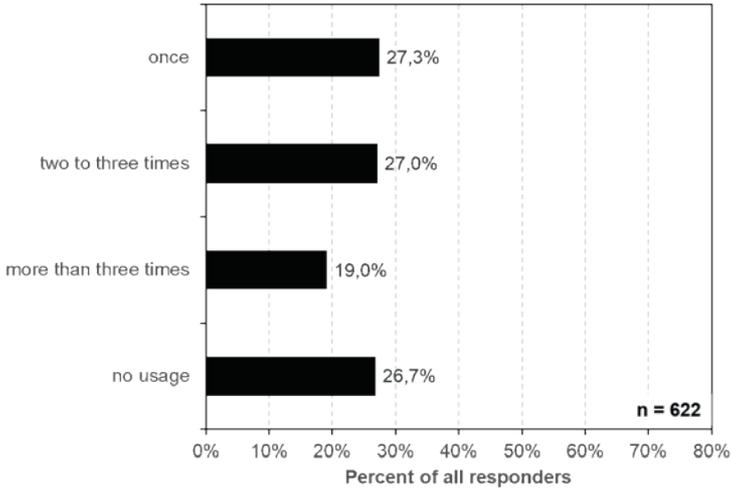


Figure 4. Number of courses (times) probiotics/synbiotics were used during the past year

#### ***Average length of treatment course (Q8)***

Nearly two thirds of study participants stated that the average intake length was about a week, while a quarter said it was about a month (Figure 5). One out of twenty were taking probiotics/synbiotics on a daily basis.

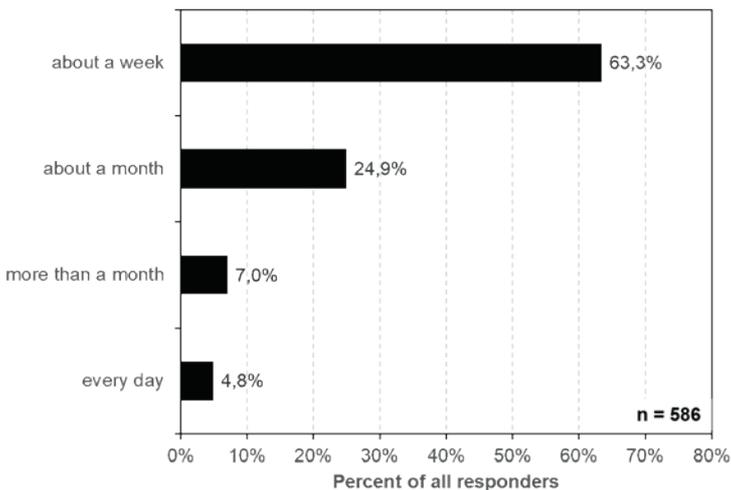


Figure 5. Average length of a course of probiotics/synbiotics intake

**Selection of a particular product (Q9–Q12)**

***Criteria influencing product selection (Q9)***

When selecting a particular product, the recommendations provided by physicians and pharmacists were of particular importance (Figure 6). Nearly one fifth of the study participants preferred a brand that they already knew. For about 14% of the study participants the price was the major driver for the product selection.

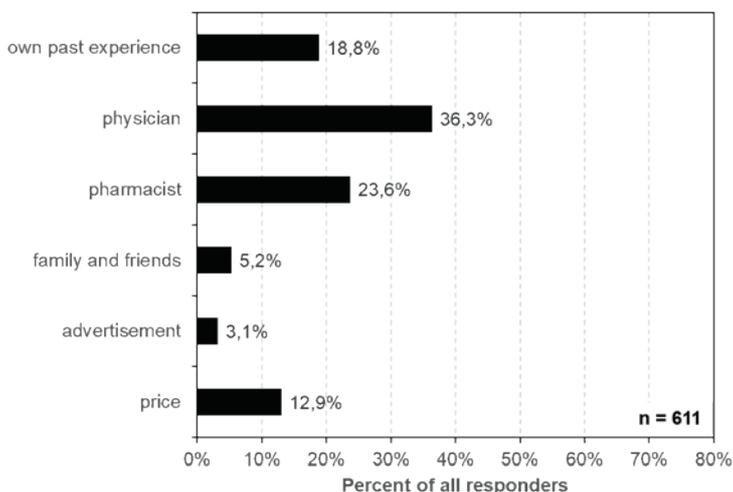


Figure 6. Importance of drivers for selecting a particular product

***Quantitative, qualitative and technological features as product selection criteria (Q10–Q12)***

There were 618 participants who answered the question asking if the quantitative product composition (the amount and number of different probiotic strains) was important for their product selection: 33.2% of responders stated that this product feature was of importance for their product choice; 46.9% stated that it had no relevance; and 19.9% declared that they were not aware that products could differ in this respect.

Qualitative product features (the type of probiotic microorganisms contained in a product) were a relevant piece of product information in the course of selecting a product for 32.3% of responders. However, 49.8% of study participants admitted that this feature did not influence their selection, whilst 18.0% stated that they were not aware that this kind of product could differ in qualitative features. In total, 617 participants answered this question while it was skipped by 5 participants.

Overall, 9.4% of survey responders declared that they checked the technology (e.g., enteric coating) used for the production of a product before making a purchase decision. For 66.1% the production technology had no relevance and 24.5% declared not being aware that there might be differences in the way probiotics or synbiotics are manufactured. Altogether, 617 participants answered this question.

#### **Responders' product and product category knowledge (Q13–Q15)**

##### ***Responders' knowledge about the difference between probiotics and synbiotics (Q13)***

To evaluate if study participants knew the difference between a probiotic and a synbiotic they were asked to check the correctness of two statements (one correct and one wrong) about synbiotics, or to state if they didn't know the difference. In total, 35.0% of responders were able to select the correct statement, while 10.2% of responders chose the incorrect statement. However, more than half of study participants (54.8%) stated that they did not know the difference between a probiotic and a synbiotic. Altogether, 620 participants answered this question.

##### ***Responders' assesment of effectiveness of probiotics or synbiotics (Q14)***

Asked if all probiotic/synbiotic products available on the market were equally effective, 14.1% answered "yes", 36.4% "no" and 49.5 stated "I don't know" (total number of responders 618).

**Responders’ assesment of effectiveness of probiotics or synbiotics (Q15)**

When participants were asked if they believed that more expensive products had a better efficacy, 12.9% answered “yes”, 36.9% ‘no’ and 50.2 “I don’t know” (total number of responders 621).

**Responders’ experience using probiotics or synbiotics (Q16)**

Questioned about their experience of using probiotics or synbiotics, half of the survey participants stated that the administration of these products helped “very well” or “well” (Figure 7). The other half stated that the intake of such products “helps [them] to feel a little better” or that they were “not sure if they help me”.

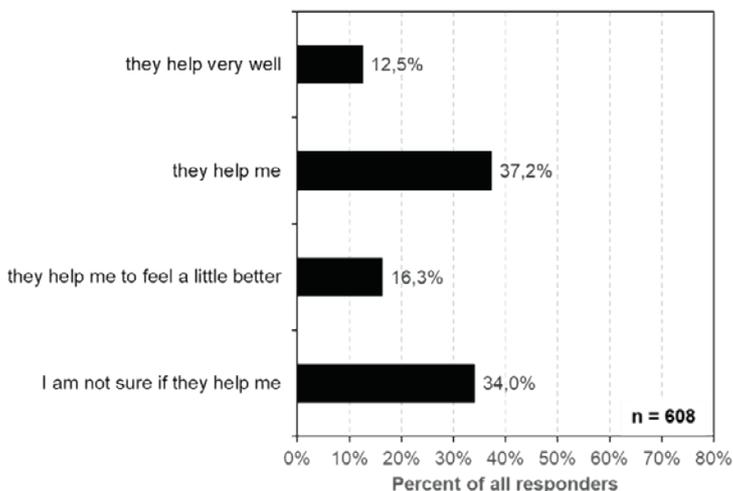


Figure 7. Responders’ experiences using probiotics or synbiotics

**Net promoter score (Q17)**

Among the 616 survey participants who answered the NPS question, 282 qualified as promoters, while 183 detractors were identified. Based on these numbers a net promoter score of 16.1 was determined. Net promoter scores

were determined for the four individual experience groups (Q16) and plotted in figure 8. The better the past experience of customers with using probiotics or synbiotics, the higher the net promoter score.

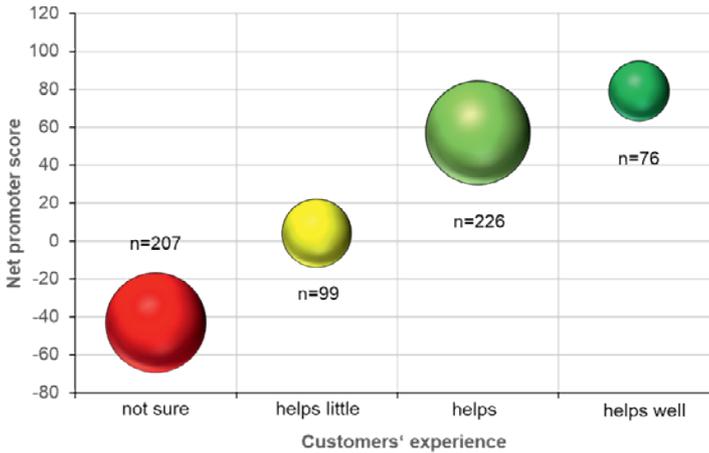


Figure 8. Net promoter scores as function of customers' past experience with use of probiotics and synbiotics. Bubble sizes indicate the number of responders

## Discussion

There were nearly twice as many females than males among study participants. In addition, 54.1% of the responders stated that they had either a "higher" or a "higher with degree" educational background. Possible explanations for the high rates of females and of participants having a higher educational background can be that these groups are more willing to contribute to this kind of research or that they are more interested in the subject of the survey. An interpretation of the results of the present study must take this particular aspect of the participants' characteristics into account. The average age of participants was 42.6 years which is close to the average (2020: 41.7 years) of the Polish population [20]. In regard to whether responders lived in urban or rural areas, 63.9% stated they had an urban residence which is close to the number (2020: 60.2%) for the Polish population as a whole [20].

The dominant reason, stated by more than half of all responders, for taking a probiotic or a synbiotic, was to complement antibiotic (AB-)therapy. To use products from this category for this purpose is supported by meta-analyses demonstrating that probiotics have a beneficial effect on antibiotic-associated diarrhea [21, 22]. Treatment of irritable bowel syndrome (IBS) was stated as an intake trigger by 4.8% of the responders. There is growing evidence that probiotics have potential for the treatment of IBS and that they can be safely used in this patient cohort [23]. Other medical indications (acne, skin infections) were mentioned by participants under the category “other reasons”. Adding together all responders who use probiotics or synbiotics for a specifically defined medical issue revealed that this group accounts for about two thirds of all responders. For nearly a fifth of the survey participants, prophylactic use (either for supporting “gut health” or the “immune system”) was the trigger for taking probiotics or synbiotics. For the remaining participants intake was prompted by less-clearly defined general “gastrointestinal problems” or “other” reasons. These results show that the majority of consumers are driven by a concrete and specific medical reason when taking probiotics or synbiotics. That this kind of product has benefits in the indications stated by consumers is backed by current scientific and clinical knowledge. Besides a medical reason for taking probiotics or synbiotics, other important drivers for intake were past experience with their application or the recommendation by a physician. Interestingly enough, the recommendation by a pharmacist was relevant only for a small number of the survey participants. This finding clearly shows the key role of physicians in the initiation of using products from this category. At the same time, the survey data demonstrate that consumers do not generally trust pharmacists with regard to a recommendation to initiate the intake of this kind of product. A potential reason could be that consumers are afraid of the potential conflicting financial interests that pharmacists have with these products. Unsurprisingly, the majority of survey participants claimed that advertisements did not influence them too much in terms of initiating product intake.

With nearly two thirds of the survey participants who took a probiotic last year having administered more than one treatment course, multiple intake

cycles per year were more the norm than the exception. For the majority of the responders the average length of intake was about a week. We have analyzed the data to see if there are relations between the reason why the probiotic or synbiotic was taken (Q5) and the number of cycles (Q7) and/or the length of intake (Q8). However, there does not seem to be a clear correlation. Nevertheless, in the responder group using probiotics in combination with antibiotic therapy there was a trend for a shorter duration of treatment, while in the responder group using them for IBS treatment the treatment durations were frequently longer (data not shown). In this regard, a future analysis of the data using more sophisticated statistical tools is planned.

When it comes to selecting a particular probiotic or synbiotic product three key drivers have been identified in the present study. Most important for the selection of a particular product was the recommendation by a physician. As found for the initiation of intake, physicians also seem to be the accepted authority for many consumers with regard to product selection. Interestingly enough, pharmacists play a role in product selection, which is different from what was found in regard to their role in intake initiation. Nearly a quarter of consumers held that the recommendation of their pharmacist was important for product selection. It can be concluded that consumers assume that the pharmacist has a product competence, but not an indication competence. Price is a factor that influences product selection by consumers, but it is not very dominant. This is interesting as consumers have to pay in full for probiotics and synbiotics as these products are normally not covered by health insurance. As at least some of the products in the category can be costly, the study data show that good past experience and the recommendation of a healthcare professional can push price concerns to a lower level within the consumer's decision hierarchy.

Results from the survey also show that quantitative (amount or number of probiotic strains) or qualitative (kind of probiotic strains) product features were relevant for less than half of responders to the survey. For the rest of the study participants these features were irrelevant or they were unaware that there were differences among products from this category. This is of interest as both quantitative and qualitative features are key factors when it comes to product efficacy [11, 12, 15, 16, 17]. Even less important for consumers' product selection was the

technology by which a given product is produced. Only 1 out of 10 consumers checked for this product property, a property which has been demonstrated to be highly relevant in regard to whether probiotic bacteria can arrive alive in the intestine [15, 14]. With key product features of relevance ignored by a majority of consumers, it would be interesting to evaluate what kind of arguments physicians and pharmacists use to differentiate the different products when communicating with consumers. However, this question is beyond the scope of the current survey and has to be addressed by a follow-up study at a later point in time.

The present survey was also not designed to perform an in-depth evaluation of consumers' knowledge about probiotics, synbiotics or the product category in general. However, some research on this was conducted in the current study. About a third of responders were able to select the correct statement about the difference between a synbiotic and a probiotic. One in ten selected the wrong answer while more than half were careful enough to state that they did not know.

Only a little more than one third of study participants stated that they believed that there were differences in terms of efficacy among products from the category; the remaining responders either stated that they did not know or that they believed all products were equally effective. Interestingly enough, nearly 13% of consumers believed that more expensive products were more effective.

When asked about the perceived efficacy of probiotics or synbiotics nearly half of study participants stated that these products "help" or "help very well". The other half stated after administration they felt "a little better" or that they were "not so sure if the intake" was helping them. Therefore, results of the present study indicate that self-assessment of the efficacy of the product by patients is in principle possible. More studies need to be performed to evaluate if the self-assessment of the patients is correlated with clinical outcome measures.

When the net promoter scores were calculated for the four groups of 'customer experience' it was found that in the groups "help" and "help very well" the net promoter scores (NPS) were very high. These high NPS-values indicate a strong dominance of product promoters in these two "experience"-groups.

The NPS-value in the “help me to feel a little better”-group indicates that in this group the number of promoters is offset by an equal number of detractors. Not surprisingly, in the group of customers not being sure that they benefit from taking products from this category, the number of detractors is bigger than the number of promoters, resulting in a negative NPS-value. The results show that experiencing benefits from taking probiotics or synbiotics develops users into potential advocates for the product category.

Future studies are needed to evaluate in more depth how physicians and pharmacists can support their patients and customers to make rational and evidence-based decisions about initiating therapy with probiotics and synbiotics, and how to best make a product selection from the numerous products on offer in that category.

## **Conclusions**

Professional healthcare service providers should be aware that the majority of consumers have limited knowledge when it comes to product features relevant for differentiating products from the category of probiotics or synbiotics. Results from the present study demonstrate that physicians and to a somewhat lesser extent pharmacists play an important role in helping consumers to make rational decisions in regard to initiating the intake of probiotics or synbiotics and for making product selection decisions based on scientific evidence. Addressing the consumers’ knowledge gaps can improve the relationship between healthcare professionals and consumers and could allow consumers to make better decisions for their wellbeing. In case consumers experience positive product effects they most likely will become promoters for the product category, which can contribute to the enlargement of the group of consumers using this kind of product.

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