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## PRODUCT INNOVATION IN ISOTONIC DRINKS – EXPECTATIONS OF TRI-CITY UNIVERSITY STUDENTS

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**Abstract:** The aim of this study was to recognise the expectations of consumers towards isotonic drinks, which was made possible due to the study conducted employing an online survey method. The study group consisted of 162 students. The majority of the consumers surveyed did not consume isotonic drinks, and a large proportion of the drinkers consumed them only occasionally. However, a significant number of students were willing to pay a high price for them, in comparison to the low price of other drinks commonly found on the market. Although fruit flavours were identified as the most preferred flavours of potential beverages, consumers were also interested in new flavours such as tea, herbal, honey and nut. Depending on their declared gender and year of study, respondents indicated different packaging preferences. Interest in purchasing beverages based on natural ingredients and colourants was observed among the students.

**Keywords:** isotonic drinks, product innovation, consumer expectations, students.

### 1. INTRODUCTION

The increasing globalism and competitiveness of the business environment drives companies to invest in the development of new products, and emerging market novelties are becoming increasingly important to modern consumers [Badowska 2012]. These behaviours of potential buyers influence food companies' decisions to invest in innovation, especially product innovation. Developing new products and convincing the potential consumer to buy them constitutes a challenge for today's food industry. When creating new and innovative products, it is important to understand the needs and requirements of potential consumers.

Young people are a special group in society. They have a different perception of the world, different needs, different value systems and different ways of behaving to adults, while at the same time they have considerable purchasing power and increasing financial resources. Students are a noteworthy group in this context. College and university education is a period when young people begin to become

independent, also in terms of choosing products or their place of purchase [Jäder 2018]. Learning about the preferences of these groups of consumers regarding new and innovative products, as well as determining the possibility of influencing their purchase decisions, may be an important factor in creating demand for the goods sold.

## **2. INNOVATION, PRODUCT INNOVATION AND INNOVATION IN THE FOOD INDUSTRY**

Interest in the topic of innovation has been observed for decades. During that time, its definition has changed and its perception by different researchers from Schumpeter to contemporary authors has varied [Ramadani et al. 2019]. The modern definition assumes that innovation is a process, namely the activity of creating a new product or service, a new technology, a new organisation, or improving existing products or services using existing technological and organisational processes [Ramadani and Gërguri 2011]. A similar definition of innovation has been proposed within a document created by the OECD and Eurostat. The definition of innovation contained therein assumes that it is a new or improved product or process (or a combination thereof) that differs significantly from the entity's previous products or processes and that has been made available to potential users (product) or put into use by the entity (process) [OECD/Eurostat 2018]. Both the definition of the Oslo Manual and the definitions of various scientific researchers adopt a division of innovation into process innovation (concerning the ways of organising and combining inputs in the production process and other business processes), and product innovation, and some sources also distinguish organisational innovation (concerning the resources of the organisation) [OECD/Eurostat 2018; Ramadani et al. 2019].

Product innovation is concerned with creating a product or service, rather than the mentioned business processes or resources of an organisation [Ramadani et al. 2019]. Product innovation is defined as a new or improved good or service that is significantly different from the company's previous goods or services and has been introduced to the market [OECD/Eurostat 2018]. Such innovation must provide a significant improvement in at least one characteristic or performance specification of the product. It involves adding new features to a product or improving existing ones. The important features that can be improved include quality, technical specifications, reliability, durability, economy of use, affordability, comfort, usefulness and ease of use. Product innovation implies a possible simultaneous loss of other features or a decrease in some performance specifications in favour of improved features [OECD/Eurostat 2018].

Product innovation is also characteristic of the food industry. The emergence of new, innovative products in this industry is not only dictated by the desire to increase

the competitiveness of companies, but is also a response to contemporary trends and problems in society. In recent years, lifestyle-related diseases such as obesity, type 2 diabetes and heart disease have been seen increasing in society. This has gained increased attention from governments, the public, and increased consumer awareness of the health effects of the food they eat. This situation is causing changes in the activities of the food sector. Food companies are gradually taking responsibility for public health and playing a role in preventing and mitigating public health problems. Innovative products are created by modifying the composition of food products in order to reduce selected ingredients such as saturated fatty acids, salt or sugar. Such activity can be understood as responsible innovation, as companies do not focus only on private economic goals, but also contribute to preventing the development of civilisation diseases [Asveld et al. 2017].

The beverage group is a special group of products in the food industry. It is the branch of the food industry where most innovative products are introduced [Polski Kongres Napojowy 2019]. Product innovations often involve functional and healthy beverages.

### **3. CHARACTERISTICS OF FUNCTIONAL BEVERAGES AND ISOTONIC DRINKS**

Functional beverages are an example of products in the functional food group. The European Commission defines such foods as products which, in addition to their primary nutritional effect, have a beneficial effect on one or more functions of the human body, thereby improving general and physical conditions and/or reducing the risk of developing diseases [Corbo et al. 2014]. The group of functional beverages also includes isotonic drinks for athletes. Isotonic drinks contain water, carbohydrates in the form of mono or polysaccharides, electrolyte salts, B group vitamins and juices, colours, and flavours that improve their organoleptic properties [Stasiuk and Przybyłowski 2015; Pivnenko, Esipenko and Kovalev 2018]. Through the right proportions of ingredients (especially carbohydrates and minerals), they have osmolality<sup>1</sup> levels close to the osmotic pressure of blood, thus ensuring relatively fast absorption of minerals and water and assisting in keeping the body hydrated [EFSA 2011; Stasiuk and Przybyłowski 2017].

The appropriate osmolality for this type of products is defined by the European Food Safety Authority (EFSA), which assumes that it should be at the level of 300 mOsm +/- 10% (270–330 mOsm/ kg of water) [EFSA 2011]. Drinks below this value are referred to as hypotonic, and those above – hypertonic. Isotonic drinks should be consumed during or after exercise. Their consumption is recommended during

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<sup>1</sup> The sum of all kinetically active particles, such as cations, anions and non-electrolytes, diluted in 1 kg of solvent (water) [Pivnenko, Esipenko and Kovalev 2018].

exercise lasting over 60 minutes or after exercise to replenish water, electrolytes and glucose losses in the form of glycogen [Styburski et al. 2019].

#### **4. INNOVATIVE ISOTONIC DRINKS ON THE MARKET AND IN LITERATURE**

Today's functional beverage market is open to innovative products. Innovative drinks are being introduced in many countries around the world, especially those with health-promoting effects such as probiotic fermented coffee and tea, drinks with reishi mushroom extract, aloe vera drinks and electrolyte drinks enriched with zinc. Of great interest to producers are alcoholic and non-alcoholic beverages with the addition of hemp or its components, especially cannabidiol (CBD) [Bogacz 2021a,b,c]. Despite the introduction of numerous innovations in the functional beverage group, such activities rarely concern isotonic drinks (especially in the context of innovations concerning the increase of their potential health-promoting effects). However, global researchers are showing interest in increasing the health value of these types of beverages. Such studies were conducted by, among others, the teams of Gironés-Vilaplana et al. (2013, 2013 and 2016) in which isotonic drinks were fortified with plant-based raw materials. Maqui berry, blackthorn plum, and acai berries were added to engineered isotonic beverages to increase their antioxidant potential [Girones-Vilaplana et al. 2013]. Studies involving the enrichment of isotonic drink were also undertaken by Porfírio et al. (2020) by adding an extract of *Plinia cauliflora* (*Myrciaria jabuticaba*) to the beverage. An innovative drink was also created by the team of Pivnenko et al. (2018), who designed isotonic drinks based on the tissue fluid of the *Rhopilema* jellyfish.

Previous research results and the growing interest in innovative functional beverages indicate the need to understand the expectations of the modern consumer of these beverages. This task has been undertaken in the present work.

#### **5. AIM OF THE STUDY, MATERIALS AND METHODS**

The aim of this study was to recognise consumers' expectations towards isotonic drinks. The objective was accomplished by conducting a study that employed an online survey method. The author's survey questionnaire contained 22 single and multiple choice questions. Only a selection of these are included for the purposes of this publication. The questionnaire examined the amount of isotonic drinks consumed, acceptable price, preferred composition, product and packaging features, and factors that deter consumers from purchasing isotonic drinks. Due to the ongoing pandemic, limiting the freedom of purchase decisions, respondents were asked to complete their answers taking into account the time before the COVID-19 pandemic.

The study group consisted of 162 students. The study involved full-time and part-time students of Tri-City universities (Gdańsk University of Technology, Gdynia Maritime University, Medical University of Gdansk, University of Physical Education and Sport in Gdańsk, Gdańsk School of Banking and the University of Social Sciences and Humanities in Sopot).

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

**Table 1.** Characteristics of the study population

Demographics	Percentage of respondents
<b>Gender</b>	
Female	65.43
Male	34.57
<b>Age</b>	
18–22	40.74
23–26	54.94
27 and above	4.32
<b>Years of study</b>	
1	20.41
2	14.29
3	25.85
4	20.41
5	19.05

Source: our own study.

For the purpose of the results discussed, the research group was divided into men and women and students of 1–3 (undergraduate) and 4–5 (graduate) years of study. The division according to the years of study was due to the possible influence of the knowledge gained at university (especially in the fields of health and nutrition) on the respondents' answers. The age of students in the 1–3 years of study ranged from 18 to 29, with the largest group (nearly 80%) being students aged 20–23. The age of the 4–5 years of study students ranged from 22 to 39, of which about 86% were students aged 23–25.

## 6. RESULTS

Firstly, the amount of isotonic drinks consumed was examined in the group of Tri-City's students.

The results regarding the consumption rate of isotonic drinks are shown in Table 2.

**Table 2.** Consumption of isotonic drinks by respondents

Declared consumption of isotonic drinks per week	Percentage of responses				
	Total	Women	Men	Students 1–3 years of study	Students 4–5 years of study
None	71.60	80.19	55.36	69.66	74.14
Less than 1 bottle (750 ml)	21.60	16.98	30.36	20.23	22.41
1 bottle (750 ml)	2.47	0.94	5.36	4.50	0.00
2–4 bottles (1,500–3,000 ml)	3.08	1.89	5.36	3.37	3.45
5–7 bottles (3,750–5,250 ml)	0.61	0.00	1.78	1.12	0.00
8 bottles and above (6,000 ml and above)	0.61	0.00	1.78	1.12	0.00

*Source: our own study.*

A vast majority of respondents said they do not consume isotonic drinks (over 71%). Among those that did, the most common response across all groups was less than 1 bottle per week (21.6%). Lower consumption of isotonic drinks was observed among women. Despite this, only about 14% of men reported consuming more than or exactly 1 bottle of this type of drink per week. There were no significant differences in the consumption of these beverages among students with 1–3 years of study and students with 4–5 years of study.

Since many of the respondents declared that they did not consume isotonic drinks, they were asked about the reason for this. The question allowed respondents to select more than one answer.

The results are shown in Table 3.

**Table 3.** Factors that deter consumption of isotonic drinks

Declared deterrent to consumption	Percentage of responses				
	Total	Women	Men	Students 1–3 years of study	Students 4–5 years of study
No noticeable need to consume	87.16	86.59	88.89	87.93	85.37
Negative health effects	12.84	15.85	3.70	12.07	14.63
Unacceptable taste	26.61	30.49	14.81	22.41	24.39
Excessive cost	4.59	12.20	3.70	3.45	7.32

Source: our own study.

The main factor stopping consumers from consuming isotonic drinks was the lack of a perceived need for isotonic drinks. This may be due to the lack of interest of some of the respondents in physical activity (61% of the respondents were not involved in sport or exercised occasionally) or the lack of awareness of the positive effect of isotonic drinks on sports performance (only about 42% consumed these drinks because of physical activity). The second most important factor was the unacceptable taste of these drinks. This factor was more significant for women than for men. Women were also more likely to highlight possible negative health effects associated with isotonic drink consumption. Few respondents were driven by the excessive cost of these types of drinks (4.59%). No significant differences were observed in the responses of students with 1–3 years of study and students with 4–5 years of study.

Although the low consumption of isotonic drinks among students may be an argument for investing in product innovation in other product groups, it is important to analyse how much the modern isotonic drink consumer is willing to pay for one bottle of this product.

Table 4 shows the answer to this question regarding the acceptable price of isotonic drinks.

Despite the low consumption of isotonic drinks in the study group, more than 33.33% of respondents were willing to pay PLN 4.00 or more for a bottle of isotonic drink. The largest group (nearly 40%) said they were willing to pay PLN 3.00–3.99. Few declared the acceptable price of a drink to be lower than PLN 1.99. A higher acceptable price of a drink was declared by women. Almost 50% of the women were willing to pay PLN 4.00 or more. Among men, only about 25% declared a price of PLN 4.00 or more to be acceptable. A price of PLN 4.00 or more was more often cited as acceptable in the group of students with 1–3 years of study.

**Table 4.** Acceptable price of isotonic drink as perceived by respondents

Acceptable price for 750 ml isotonic drink according to the respondents	Percentage of responses				
	Total	Women	Men	Students 1–3 years of study	Students 4–5 years of study
Less than PLN 1.00	0.00	0.00	0.00	0.00	0.00
PLN 1.00–1.99	2.27	0.00	4.35	0.00	7.14
PLN 2.00–2.99	22.73	14.29	30.43	30.77	14.29
PLN 3.00–3.99	38.64	38.10	39.13	26.92	50.00
PLN 4.00–4.99	29.55	38.10	21.74	30.77	28.57
PLN 5.00 or more	6.82	9.52	4.35	11.54	0.00

*Source: our own study.*

The next question asked concerned preferred flavours of isotonic drinks. Many flavours of isotonic drinks currently unavailable on the Polish market were proposed. The question allowed respondents to select more than one answer.

The results for preferred flavours are shown in Table 5.

The largest group of respondents indicated fruit flavour as the preferred flavour of isotonic drinks (73.33%), which was also the most popular flavour of such drinks available on the market. This flavour was chosen more often by women than by men. Tea flavour (37.78% overall and 42.86% among women) and herbal flavour (33.33% overall and 52.38% among women) were identified as the preferred flavour among many respondents (especially women). Nearly 15% of respondents indicated preference for flavours such as coffee or honey. More interest in tea and herbal flavours and less interest in fruit flavours was observed among students with 1–3 years of study compared to students with 4–5 years of study.

Therefore it is possible that the new flavours identified below (Table 5) would be of interest not only to existing isotonic drinkers but also to non-isotonic drinkers since, as already mentioned, over a quarter of them considered the unacceptable taste as a deterrent.

Respondents were asked about the packaging in which they would like to buy isotonic drinks. Since the most popular packaging for this beverage on the market is the plastic bottle, they were asked about their preferred type of packaging and also type of closure. The question allowed respondents to select more than one answer.

**Table 5.** Respondents' preferred flavour of isotonic drinks

Acceptable price for 750 ml isotonic drink according to the respondents	Percentage of responses				
	Total	Women	Men	Students 1–3 years of study	Students 4–5 years of study
Tea	37.78	42.86	33.33	46.15	13.3
Coffee	13.33	9.52	8.33	11.54	13.3
Coconut	8.89	9.52	8.33	11.54	6.7
Candy	6.67	4.76	8.33	11.54	0.0
Honey	15.56	14.29	16.67	23.08	0.0
Nut	6.67	0.00	12.50	11.54	0.0
Fruit	73.33	80.95	62.50	69.23	86.7
Cola	6.67	0.00	12.50	7.69	6.7
Beer or malt	8.89	4.76	16.67	11.54	6.7
Spices	4.44	4.76	4.17	3.85	0.0
Vegetable	4.44	4.76	4.17	0.00	6.7
Wine	2.22	4.76	0.00	3.85	0.0
Herbal	33.33	52.38	16.67	38.46	20.0

Source: our own study.

The most frequently chosen packaging in all groups was a 500–750 ml plastic bottle of isotonic drink. More than 20% of respondents indicated preference for a type of packaging which is unavailable on the Polish market (glass bottle) or less popular (can). Nearly 16% would buy a drink in a plastic bottle larger than 750 ml. Almost 40% of the women would prefer to buy isotonic drinks in a glass bottle. This may be due to the perception that this packaging is more eco-friendly. Students with 1–3 years of study also demonstrated this tendency. Men and students with 4–5 years of study would prefer isotonic drinks in cans or plastic bottles larger than 750 ml instead of glass bottles. Other responses regarding packaging type included biodegradable, recycled or recyclable packaging and packaging containing multiple servings of powdered beverage.

Most respondents prefer a sports cap on isotonic drinks, which is used in most sports drinks in the market. Nevertheless, almost 40% would choose a drink with a standard cap. Among other responses, respondents indicated drinks in cans or bottles. The results of the packaging survey show a significant variation in responses

depending on belonging to a particular group. Creating new packages of isotonic drinks can therefore be a way to gain the interest of consumers, but it requires conducting research into the preferences of the target group.

**Table 6.** Respondents' preferred packaging of isotonic drinks

Preferred packaging for isotonic drinks	Percentage of responses				
	Total	Women	Men	Students 1–3 years of study	Students 4–5 years of study
<b>Type of packaging</b>					
Plastic bottle, 500–750 ml	61.36	61.90	60.87	53.85	71.43
Larger plastic bottle	15.91	9.52	21.74	7.69	21.43
Glass bottle, 250–500 ml	22.73	38.10	8.70	26.92	14.29
Can, 330-500 ml	20.45	14.29	26.09	19.23	28.57
Other	6.82	9.52	4.35	11.54	0.00
<b>Type of drink bottle closure</b>					
Standard bottle cap	39.13	47.62	32.00	29.63	46.67
Sports cap (with a spout)	56.52	47.62	64.00	62.96	53.33
Other	4.34	4.76	4.00	7.40	0.00

*Source: our own study.*

Due to the current health-oriented trend in the market, respondents were asked about their willingness to purchase an isotonic drink based on natural ingredients and colours.

The responses to this question are shown in Table 7.

**Table 7.** Consumer interest in buying an isotonic drink based on natural ingredients and colourants

Declaration of purchase	Percentage of responses				
	Total	Women	Men	Students 1–3 years of study	Students 4–5 years of study
I would be interested in buying	77.78	90.48	66.67	80.77	80.00
I wouldn't be interested in buying	22.22	9.52	33.33	19.23	20.00

*Source: our own study.*

A significant interest in purchasing beverages based on natural ingredients and colourants was observed among the students (77.78%). This is in line with contemporary health-promoting trends. The willingness to purchase such products was declared more often by women (90.48%) than by men (66.67%). No differences were observed in the responses between students with 1–3 years of study and students with 4–5 years of study.

Comparing these results with the respondents' answers regarding preferred flavours, it can be posited that drinks based on natural ingredients and colourants derived from herbs, tea or fruit could meet their demand.

## 7. CONCLUSIONS

The majority of the consumers surveyed did not consume isotonic drinks, and a large proportion of the drinkers consumed them only occasionally. The most common reason for not drinking isotonic drinks was the lack of a perceived need for such products. For a large proportion of respondents, such drinks were also associated with an unacceptable flavour and possible negative health effects. This means that the producers of such beverages should run marketing campaigns that include making the public aware of the desirability and positive consequences of consuming these beverages, with sales activities targeted mainly at physically active people.

Despite the low consumption of isotonic drinks, a significant number of the consumers were willing to pay a high price for them, in comparison to the low price of other drinks commonly found on the market. Women and students with 1–3 years of study are more likely to pay a higher price (above PLN 4.00). The most preferred flavours of a potential isotonic drink are fruit flavours. A significant percentage of respondents also indicated preference for tea flavours, herb flavours, and some indicated preference for honey or nut flavours. Consumer interest in new flavours indicates a potential opportunity to introduce new isotonic beverages to the market. Respondents indicated different packaging preferences depending on their belonging to a particular group. These results show a possible opportunity for consumer interest in new packaging, but research is required to determine the preferences of the target group. Beverages that have the potential to gain a competitive edge in the market are those based on natural ingredients and colourants.

The results of the research show a potential opportunity to market and gain consumer interest in the student group with a beverage based on natural ingredients and colourants based on fruit, tea or herbs. However, the low consumption of these beverages by the consumers surveyed and the varied results on preferred packaging outline the need for appropriate marketing activities and the right selection of and creation of awareness in the target group.

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