Perception, acceptability and decision-making determinants of Soft Seltzer, a novel winegrape non-alcoholic carbonated beverage category to health-conscious College students in California

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ABSTRACT

The beverage industry is a significant market that is seeing a growth albeit certain types of beverages such as wine and soda-type drinks are seemingly declining. There is certainly seen a growing interest for novel beverages, especially when creating healthy options aiming to support health via enhanced functional food/beverage properties. Furthermore, understanding how the public perceives and makes purchasing decisions towards novel and unconventional options is of key importance. The Soft Seltzer category is an emerging category defined as a sparkling water-based low calorie, no added sugar, no artificial sweetener, non-alcoholic, carbonated beverage. In our pilot study herein, we aimed to assess interest and willingness to pay for such a product produced in Sonoma, California, specifically H2O/H_2♡, a dealcoholized wine-type beverage enriched with vitamins, potassium, and calcium, using a perception and acceptability study to health-conscious college students in California. Respectivelly, healthy college students were provided an on-line acceptability questionnaire with 38 questions to evaluate the concept of the H2O beverage. Our participants indicated that they would be significantly interested in purchasing such a beverage, while as for willingness to pay, a price for $9.99/4x16oz cans was deemed

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less than or about what is expected from a majority of participants. Our results taken together demonstrate that there is substantial interest and traction for such a beverage, especially given its natural origin and potential health benefits. Further research including tasting and health-related functional properties for the beverage in discussion is suggested. Additionally, lifestyle aspects and nuances beyond alcohol that are important to wine drinkers and other consumers could be delivered by novel beverages, hence aid in their success in the beverage market.

JEL classification: L1, M3, O3, Z1.

Keywords: Consumption, Purchase decision making, Soft Seltzer, Sparkling Water, Wine Grape Infused, Fruit-Flavored Functional Beverage, California Wine Grapes

1. INTRODUCTION

The beverage industry is a significant market within the food industry which has seen interesting trends in the recent years. More specifically, while the industry seems to be growing overall, the alcoholic portion, as well as the soft drink portion of the industry, both appear to be declining. These observations strengthen the notion that the modern consumers have different requirements and expectations from the beverages available on the market. It is therefore important to understand how the public perceives and makes purchasing decisions towards such options.

Furthermore, average calorie intake for Americans over the age of two increased by 150–300 kcal/day, depending on age and sex, between 1970–2000, and it has been estimated that as much as 50% of this intake could be due to the consumption of calorie-dense beverages (Popkin et al., 2006; de Ruyter et al., 2012; Jin et al., 2012; Papandreou et al., 2012; Welsh et al., 2011; JN et al., 2005; Durão et al, 2015; Mirmiran et al, 2014). In this regard, there is significant concern as per the consumption of energy-dense, often simultaneously no- or low-nutrient, beverages that may be contributors to obesity and subsequently related metabolic diseases mainly Type 2 Diabetes Mellitus (T2DM), cardiovascular disease (CVD) or cancer (de Ruyter et al., 2012; Jin et al., 2012; Papandreou et al., 2012; Welsh et al., 2011; JN et al., 2005; Durão et al, 2015; Mirmiran et al, 2014; Vilela et al., 2014; Yari et al., 2020; Chandran et al., 2014; Sikalidis et al., 2013).

In the US, from 1999-2000 to 2009-2010 the consumption of sugar-sweetened beverages (SSBs) declined in both youth and adult population (by 68 and 45 kcal/day respectively) (Rehm et al., 2016, Kit et al., 2013). Diet beverages or beverages containing low calorie sweeteners (LCS), i.e. sweeteners of high intensity approved or not objected by the US Food and Drug Administration (FDA), thus few to no calories, have emerged as a preferred alternative for consumers in the light of robust and abundant evidence linking SSBs to weight gain and other adverse health effects (Johnson et al., 2018). However, replacing SSBs with LCS beverages is controversial due to potential safety concerns such as increased risk of certain cancers with prolonged and heavy consumption of artificial sweeteners (Mishra et al., 2015), and inconclusive evidence on health effects related to obesity, diabetes and cardiovascular disease (Pereira et al., 2013).

In 2018, alcohol consumption fell by 1.5% on a global scale, according to the International Wine Spirits Record (IWSR, 2019). Consumers are apparently engaging in reduced-alcohol choices, a behavior that encourages the development of drinks, targeting both abstemious and consumers aiming to reduce their overall alcohol intake. Hence, this beverage category has evolved beyond soft drinks or orange juice as an alternative for these consumers during social occasions (IWSR, 2019; Colbert, 2019). According to a recent report by Klynveld Peat Marwick Goerdeler International Cooperative (KPMG), a global network providing financial services

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(Colbert, 2019) as well as mounting evidence (Pharis et al., 2018; Hua et al., 2017; Jones et al., 2019), modern consumers place an increasingly significant focus on health and wellness, thus are willing to try new and healthier alternatives to traditional soft drinks and alcoholic beverages.

Sparkling water-based beverages constitute a good alternative that when enhanced with bioactive compounds can meet these requirements. Therefore, healthy drinks such as "plant-based" waters seem to be gaining popularity, as opposed to SSBs (Colbert, 2019; Pharis et al., 2018; Hua et al., 2017). According to National Health and Nutrition Examination Survey (NHANES) data from 1999 through 2014, consumption of SSBs and LCS beverages in US adults (20+years) as well as children and adolescents (2-19 years) has been decreasing. Similar decreasing trends were observed for SSBs in the Youth Risk Behavior Survey, with a daily soda consumption in high-school students decreasing from 2007 through 2015 (33.8% to 20.4%) (Johnson et al., 2018).

In Canada, a comparison between 2004 and 2015, indicated that the reported volumes of beverages consumed decreased by 10%, with energy intake from beverages decreasing by 24%. More specifically, significant decreases were noted for 100% juice, plain milk, SSBs, diet or low-calorie beverages, and other unsweetened beverages, along with a 10% increase of the volume of plain water consumed, after adjustment for socio-demographic characteristics. Intake of alcoholic, diet or light beverages did not change significantly over time (Jones et al., 2019). Interestingly, the increase in water consumption is in line with national recommendations as Canada's Food Guide recommends water as the best choice for hydration (Government of Canada, 2020).

The Dietary Guidelines for Americans provide limited recommendations for beverages except for milk, 100% fruit juice, and alcohol (Food and Nutrition, 2020). It is proposed that guidance on beverage consumption could aid in the development of better consumer products such as beverages lower in sugar, and dense in nutrients and phytonutrients. Furthermore, appropriate beverage choices based on guidance, could address existing nutrient gaps (including lower than recommended intakes of calcium in women, potassium, vitamins A, C and D from diet alone), improve intake of phytonutrients with documented health benefits, and reduce risk for chronic disease (Ferruzzi et al., 2020).

Innovative beverage products that fulfil health and wellness support, premiumization, convenience and sustainability seem to be addressing the primary modern customer desires (Sikalidis, 2019). Therefore, design and development of beverages that support wellbeing, are non-alcoholic and low-calorie without significant artificial compound burden, may be particularly attractive to the modern consumer. Such products can address the needs of individuals with specific needs due to metabolic disease (i.e.: Type 2 Diabetes Mellitus, Hypertension), age or life-stage (i.e.: youth, pregnancy, lactation), exercising while employing a specific training regime (athletes), adhering to religious practices (lent, fasting) or are in a process of rehabilitation and/or alcohol abstinence. The modern approach for novel products in the beverage sector aims to address consumers with strong statements/beliefs such as veganism, non-GMO, ecologically and sustainability sensitive (Sikalidis, 2019). Moreover, health-conscious individuals who do not necessarily belong to any of the aforementioned categories can also benefit from such products. In this context however, understanding the drivers of acceptability for novel beverages especially when these represent a new beverage category, particularly when no prior information or pre-conceived notion are available is rather challenging, yet of key importance for the optimal introduction of innovation in a way that will respect and benefit the consumer the most (Sikalidis, 2019; Silva et al., 2016).

In our study herein, we evaluated consumer predisposition and acceptability of a novel sparkling water-based beverage the H2O (H_2♡) Sonoma Soft Seltzer line, a sparkling beverage infused with the juice of 100% California varietal wine grapes, premium California dealcoholized wine, natural flavor extracts, and pure water from an artesian well aquifer (supplement: Figure S1) at a Sonoma Valley vineyard. Furthermore, we inquired about the main criteria driving consumer

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purchasing decisions for beverages. The beverage in discussion is a novel concept product and the Soft Seltzer category is actually defined by this product as there is nothing similar in the market hence the novelty. We hypothesized that the beverage tested would be perceived positively due to its significant elements of innovation and potential for promoting healthy living and wellbeing in accordance with sustainable practices.

For our assessment, we developed a questionnaire and delivered it blindly to young college students previously enrolled in a Nutrition class, as this is a population that can constitute a potentially health conscious demographic group interested in novel healthier beverages and/or a demanding audience in accepting such type of products compared to the general population. We additionally included a set of open-ended questions aiming to indicate the major criteria driving the selection decision in the case of beverage purchases by the same population.

2. REVIEW OF CONSUMER BEHAVIOR AND PURCHASING

2.1. Background

It is necessary to identify the ideal consumer market when generating a novel product, especially considering the constant evolution of the market. The most typical approach in doing so is a consumer survey to analyze preference, motives behind purchasing, and potential consumer base and interest. A brief review examining consumer behavior in the food and beverage industry, including major drivers for purchase and major determinants of consumer attitudes, will be discussed herein.

2.2. Nutritional Knowledge and Purchasing Behavior

The International Food Information Council and American Heart Foundation state that 43% of Americans claim to always be on the lookout for healthy options when grocery shopping, whereas 52% stated to at least occasionally look for healthy foods (Buchholz, 2019), meaning that almost all Americans sometimes look for healthy foods. Therefore, marketing towards this desire is key to garner consumer interest. A comprehensive review by Wills et al. on the attitudes and purchasing habits as influenced by health claims in European consumers indicated that, consumer responses vary significantly based on the nature of product, the mode of health claim, and functional/active ingredient emphasized (Wills et al., 2012). However, there tends to be a gap in the want for healthy foods and overall nutrition knowledge, and general knowledge can be assumed to be greater than it truly is. In a study conducted in Switzerland, consumer knowledge of a healthy diet was analyzed. 1,043 survey participants were asked 13 nutritional knowledge true/false questions, as well as their typical dietary habits. The questions received between 3% and 38% incorrect responses, illustrating that nutrition misconceptions are much greater than anticipated. It was also found that individuals who consumed more vegetables scored higher, and women, those younger in age, a higher education, nutrition related qualifications, and not being on a diet all resulted in higher scores. Overall interest in nutrition resulted in a higher score, but the error of perceived healthiness was still present, highlighting the need for increased nutritional education for the general public (Dickson-Spillman et al., 2011). This is also of interest when considering marketing, as health and nutrition claims tend to be highly valued when purchasing food and beverages.

In a study conducted in Italy, 504 participants were asked about grocery buying habits, including interest in nutrition and health claims, knowledge surrounding those claims, and general product interest when shopping. Questions were provided online in a survey format. It was found that 33% of participants stated that they were influenced in their choices by health reasons, and

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33% pay attention to nutrition labels while shopping. Only 29% often considered health claims. Overall, participants had a low knowledge of nutritional index. When referring to specific health claims, it was found that many interviewees did not know the true meaning behind these claims. It was therefore concluded that while there is interest in these health and nutrition claims, it is necessary to present them to the consumer in a way that is easier to understand. This may also result in increased interest, as it appeals to a wider consumer base (Annunziata et al., 2019).

Bechoff et al. (2014) assessed the relationship between anthocyanins and sensory acceptability of various hibiscus drinks. Hibiscus drinks are popular due to their antioxidant activity, imparted on the beverage by anthocyanin activity. Four drinks were provided to 160 total volunteers. Two of the drinks were infusions and two were syrup based. Consumer preference was then measured using a 9-point hedonic scale for appearance, taste, and overall acceptance. Physical and chemical analysis was also performed to determine acidity, total soluble solids, phenolic content, and anthocyanin levels. 43% of consumers preferred syrup, 36% preferred infusions, and 21% were indifferent. The syrup acceptance was closely related to sweet taste, whereas acceptability of the infusion was closely related to anthocyanin level. Although the infusions displayed significantly higher levels of anthocyanin, infusion preference scores were lower. However, due to the reduced calories in infusions, the body conscious consumer may prefer infusions regardless, due to decreased caloric value and increased antioxidant potential (Bechoff et al., 2014).

Coffee is typically chosen for its energy effects, but also holds numerous health benefits such as decreased type 2 diabetes and cardiovascular disease risk (Kuriyama et al., 2006, Huxley et al., 2009, Van Dam et al., 2006). However, consumer knowledge of these benefits is not well known. Samoggia and Riedel analyzed consumer perception of coffee's health benefits and its effect on consumption and purchasing motives. 250 participants were asked about coffee drinking and purchasing habits through a survey. It was found that only 25% of consumers were aware of potential benefits, and those aware were typically male (31%), young (30.4%), and employed. The typical consumer primarily drank coffee for energetic effects. It was also found that 74% of consumers were more likely to pay a price premium for coffee with health benefits. Therefore, if coffee is marketed catering to these health effects, it may be beneficial to the market, as there is willingness from consumers to pay more (Samoggia & Riedel, 2019).

Functional foods, defined as food with some added physiologic benefit to enable a consumer to lead a healthier lifestyle without changing eating habits, tend to have mixed reception and understanding. Bech-Larson et al. investigated consumer perception of functional foods in Danish, Finnish, and American consumers. Background knowledge on processing, enrichment methods, health claims, and types of food were analyzed to determine specifically what changes consumer perception. 500 households/country were selected, and the individual responsible for buying groceries was interviewed. 24 standard full profile stimuli were generated, which were then rated on a 7 point scale of perceived healthiness. It was found that Danish and Finnish consumers responded more negatively towards genetically modified foods, whereas Finnish consumers responded more positively towards functional foods. Overall, there was little difference in regards to determinants of the perception of healthiness of functional foods. There were also only minor changes in reception from country to country, meaning cultural values are mildly associated. It was found that the nutritional qualities of the base product were the most important for reception, and it is therefore beneficial to use a base product that is already perceived as healthy when trying to market a functional food (Bech-Larson et al., 2003).

In a second study investigating functional foods, Sparke et al. aimed to analyze consumer motivation to purchase or refuse functional foods. Surveys were conducted in Germany, Poland, Spain, and the United Kingdom, and 590 total respondents participated. Cluster segmentation resulted in 8 consumer segments of purchasing influence for functional orange juice. It was found that fruit content was the most important (31%), followed by packaging and enrichment with dietary fiber (21% and 13%, respectively). Color was of least importance (6%). While the

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emphasis on fruit content reestablishes the need for a highly regarded nutritional baseline product (Bech-Larson et al., 2003), it illustrates that other factors, such as packaging, are of interest as well (Sparke et al., 2009).

Consumer acceptance of functional foods was evaluated in China and Germany and compared to one another to determine marketing needs by country. A group of 502 German consumers and one of 443 Chinese consumers were asked about willingness to buy a functional food over a regular one (ie. yogurt with the ability to decrease cardiovascular disease in comparison to yogurt). It was found that German consumers were much less willing to purchase functional foods, with willingness falling between 16.3% and 28.9%, depending on the question and product. Chinese participants were up to 65% more likely to purchase a functional food. It was believed that German participants did not trust that the food would be as tasty or would deliver in terms of the advertised benefits. However, in both China and Germany it was stated that health motivations were among the biggest influencers for acceptance. It is evident that altering marketing strategy by country is vital, and the demand for healthier products tends to be apparent across countries (Siegrist et al., 2015).

2.3. Factors Outside of Nutritional Knowledge

While nutrition tends to be a considerable factor in food purchasing, especially in America, it is not the only driver. Several other factors, such as price, knowledge behind processing technology, and packaging have been found to be equally as important for marketing a new product.

In a study investigating the drivers of acceptance of a new beverage in Europe, it was found that packaging, product color, and price were among the most influential choice attributes. Silva et al. investigated the acceptance of a traditional African beverage made from Bissap, highly regarded for its health benefits and antioxidant properties. Three focus groups, each with 22 participants, were asked to identify the flavor and sensory profile of beverages made from Bissap, and were then asked about reasoning behind purchase. It was found that Bissap would be selected due to health perception and novelty, and the ideal profile would be €0.99/L, <18kcal/100mL, packaged in tetra-pack, a light red color, and for the labeling information to include information about antioxidants and Bissap. Price sensitive, body concerned, and packaging attracted clusters were identified as the most influential choice attributes, illustrating that while nutrition is present, there are other factors as well (Silva et al., 2016).

Abadio Finco et al. evaluated consumer intention to purchase of pineapple juice, with an interest in packaging and manufacturing processes. 96 consumers were informed on processing techniques, and were then asked about five purchasing attributes: 1) information on manufacturing process, 2) product definition, 3) product information, 4) price, 5) brand name. It was found that brand name and price had the highest relative importance. Information on processing was determined to be an advantage to consumers as well. Therefore, it is evident that packaging and brand trust must also be considered when developing a product (Abadio Finco et al., 2010).

Similarly, Jalloh et al. studied consumer perceptions and purchasing reasons behind packaged water products in Sierra Leone to attempt to improve drinking water in the area. 25 focus groups were established, with 178 total consumers participating. Overall, packaged water was perceived as safe, accessible, and convenient, and more hygienic than alternative options. However, for those living outside the city, cost was reported as a major barrier. Brand trust was also a key factor, and personal feelings towards brands affected purchasing significantly (Jalloh et al., 2018). This again illustrates the importance of a respected brand. If a product is released under an untrusted brand, it is less likely to do well, simply due to the lack of reliance.

Quester et al. investigated the interest in 10 hypothetical wine products and the reasoning behind interest and willingness to purchase. Wine region, price, grape variety, and wine style were ranked in terms of importance by 303 consumers. Wine region was not found to be a significant

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factor, whereas price was deemed to be the most important factor when purchasing. Grape variety and wine style were also significant factors. Therefore, it is essential to create a targeted approach when marketing to attract consumers to a wine style at an optimal price (Quester et al., 1998).

It is evident that packaging is of interest for consumers, and it is likely that a well designed package will garner consumer interest. However, one area of packaging that tends to be overlooked is the environmental component. Birgelen et al. surveyed 176 German respondents to investigate ecological considerations in consumers. This study focused specifically on beverage packaging. It was found that among the 6 attributes surveyed (price, taste, healthiness, availability, ease of carrying, design), only taste and price had to be fulfilled before environmental packaging became an issue. It was stated that there is a misconception behind environmental packaging, and a belief that only a minority of consumers actively seek out environmentally friendly packaging. It is apparent that this is not the case, as this packaging ranked high in terms of importance. While good packaging is important, it is also necessary to know the market and cater to what is desired. While these results are specific to Germany, similar surveys in the products respective country may be of interest to determine demand (Birgelen et al., 2008).

Summary

Coclusively, it is evident that consumer acceptability and preference is multifactorial, and all factors must be considered when marketing a novel product. For the food and beverage market, nutritional claims and values are well regarded, especially in America, and should therefore be of priority. Well designed packaging that effectively highlights the nutritional values is key, and if the packaging allows, a background educating consumers on those claims may be beneficial as well. Lack of education regarding nutrition and misconceptions appears to be a large setback, particularly in the functional foods sector. Brand trust is also essential, as consumers generate images surrounding brands that can be difficult to alter. Finally, engaging in the market and analyzing trends is vital, such as the case with environmentally friendly packaging. Due to ever changing trends, consumer preference tests continue to be integral to identify groups of consumers that can be marketed to the most effectively.

3. MATERIALS AND METHODS

3.1. Beverage assessed and related emerging markets

The beverage assessed is the H2O/H_2♡ Sonoma Soft Seltzer, as shown in Image 1, a sparkling water-based beverage that is infused with the juice of 100% California varietal wine grapes, premium California dealcoholized wine, natural flavor extracts, added electrolytes and vitamins, using pure water from an artesian well aquifer located at a Sonoma Valley vineyard. This is a non-alcoholic drink without artificial flavors, no detectable sulfites, gluten-free, vegan-friendly, without added sugars, artificial sweeteners, GMOs, and fat-free. A small amount of carbohydrate is present due the natural sugars found in the wine grape juice used to infuse the beverage (Robert Rex, 2020).

H2O is the first of its kind in that no other Soft Seltzer on the market is non-alcoholic in wine flavor with natural flavor extracts *and* dealcoholized wine. Contingent upon consumers' unique determinants for purchase, comparable beverages may include: Sipp Eco Beverage and Co, Kin Spritz chili and pomegranate juice or Proposition Co. zero proof nonalcoholic cocktails. *Sipp Eco* similarly advertises itself as a soft seltzer made from green coffee beans and agave nectar, sold at $25 for a 12-pack. Similar to H2O, they advertise their product as “low in calories, made exclusively with clean, organic ingredients, antioxidants and Vitamin C.” Next, *Kin Spritz* is

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advertised as a sparkling citrus beverage which touts the benefits of creating a "lifted mind, relaxed mind and kindred spirit," priced at $27 for a 4-pack. Among the highlighted ingredients are the adaptogen Rhodiola Rosea and nootropics including "GABA, Caffeine, 5-HTP, citicoline, and tyrosine (which) support neurotransmitters in charge of mood, pleasure, and reward for a boost of social stamina." Finally, *Proposition Co*. zero proof nonalcoholic cocktails may appear comparable to the consumer who is attracted to H2O for its wine taste but with zero alcoholic content. At $34 for a 6-pack case, Proposition Co. makes 3 flavors and emphasizes the beverages are "better-for-you alternatives crafted with organically sourced blood oranges, ashwagandha, bitter roots, mountain herms and all-natural botanical hemp extract". H2O is a pioneer in the field of Soft Seltzers as overall purchase of alcoholic beverages and soda continues to collectively decrease; No other beverage on the market appears to match in nutritional value and the high-quality ingredient sourcing as the Sonoma Valley vineyards used by H2O (Image 1).

Image 1
Presentation of the "H2O/H_2♡ Soft Seltzer" concept to the survey participants with 8 varietal flavors (Pinot Noir; Chardonnay; Zinfandel; Sauvignon Blanc; Cabernet Sauvignon; Moscato; Rosé; Merlot)

3.2. Participants, Questionnaire and Delivery

This was an observational study evaluating consumer predisposition and acceptance of a novel product that included 184 participants in the age-range of 21-24 years old (classified as generation Z), all full-time enrolled College students at California Polytechnic State University in San Luis Obispo, California. The participants were all single, non-smokers, without underlying medical conditions, no known allergies and not taking any medications and were deemed as generally healthy young adult individuals. This student sample was also considered health-conscious (Kraft et al., 1993), indicated by their interest in nutrition by opting for an elective general education nutrition course.

Characteristics of participants are shown on Table 1. The questionnaire developed consisted of 38 questions ranging from basic demographics, to purchasing habits, drivers for determining purchasing behavior for beverages and specific questions pertinent to the beverage in assessment. Questions were audited and selected based on standard Food Science and Nutrition acceptability scales (Cardello A.V. & Jaeger S.R. 2010). Given that the assessment was on a unique product with significant novelty there was not an ideally comparable standard thus associate research assistants utilized flavored sparkling water as a standard of comparison and guidance. Those who conducted the literature review reported facing challenges in findings regarding trends and comparisons to similar products, given the unusual nature of the product.

The questionnaire was developed to evaluate participants' unique determinants for purchase as well as likelihood of purchasing the given product using a five-point Likert scale. Questions

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were both quantitative (including numerical scoring), as well as qualitative in nature, including narrative response. An example of the quantitative questions asked is '*how frequently do you consume sparkling water?'* Conversely, examples of the qualitative questions asked include '*what do you think of the displayed product above?*' and '*how would you read the logo above?'* The delivery of the questionnaire was on-line.

Table 1
Participant profile characteristics

Participants	Sex	(n)	(%)
	Female	148	80.4
	Male	36	19.6
	Total	184	100
Age range (years)		21–24	
Social Media Platform Use Preference	**Platform**	**(n)**	**(%)**
	Instagram	115	62.5
	Snapchat	33	17.9
	Twitter	17	9.3
	TikTok	13	7.1
	YouTube	4	2.2
	Pinterest	1	0.5
	Reddit	1	0.5

3.3. Analysis

Acceptability of foods and beverages is dependent on a multi-factorial array of determinants with varying importance to different consumers. As we were however primarily interested in specific determinants well established, we expressed our data as average frequencies and cumulative agggregates of positive ratings to illustrate consumer predisposition. This is an approach utilized extensively and widely in food/beverage research. Other research groups have used similar approaches in addition to conjoint analysis, in studying consumers' preferences and choice factors with numerous examples including pineapple juice (Abadio Finco et al., 2010), functional foods (Bech-Larsen et al., 2003), organic foods (Mesías et al., 2011) and wines (Gil et al., 1997; Quester et al., 1998).

Statistics

Outputs from the on-line questionnaire were compiled in an excel spreadsheet format. Data processing was performed using SPSS version 23.0 (SPSS Inc., Chicago, IL, USA). Categorical data were expressed as frequencies and percentages.

Ethics

All participants provided their informed consent for inclusion to the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the California Polytechnic State University, Institutional Review Board committee (project protocol identification and approval number: 2020-138).

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Limitations

Given the pilot/exploratory nature of the study, limitations were on-line delivery of the questionnaire without a sensory panel and convenient mode of participant selection. Also the study focused on a particular product which is category defining in the lack of a similar other one. However, that makes at this point more difficult to generalize results, thus while results are valid should be interpreted with caution.

4. RESULTS

With our study presented herein, we aimed to reveal perception attitudes and to identify potential choice characteristics for a novel sparkling water-based beverage infused with wine grape juice and California dealcoholized wine enriched with grape juice natural antioxidants, vitamins B_{12} and C, as well as electrolytes calcium and potassium.

4.1. Consumer-participant profile

Our participants were a group comprised of 184 college students of whom 148 were female (80.5%) and 36 males (19.5%), while their age group was within the 21–24 years age range. They are all non-smokers, with no known allergies or dietary restrictions, not on medication and in good general health. All participants were computer literate and interested in Nutrition and Health as they opted to enroll in an elective introductory Nutrition college-level course prior to participating in the survey. In terms of social media use, the majority were using Instagram (115) followed by Snapchat (33), Twitter (17), TikTok (13), YouTube (4) and Pinterest and Reddit (1 each) (Table 1). Given the characteristics of generation Z and their relationship with technology in terms of making choices and decisions, we wanted to have better insight into the on-line platform preferences of our participants. Generation Z's exposure to the internet, social networks, and mobile devices, formed a context that shaped a hypercognitive generation very savvy with collecting and cross-referencing various sources/types of information and with integrating virtual and offline experiences.

4.2. Participant-consumer habits as per beverage purchasing and consumption

In terms of frequency of soda drink purchasing (including diet versions), over 50% of participants (98/184) indicated on a 0-10 Likert scale (0: never – 10: every day), that they do not buy those types of beverages (0-1 ratings). This response is indicative of the level of health consciousness seen in our participants and possibly an indirect effect of their level of interest and education in Nutrition. In this question, the average was 1.75/10 ± 0.11 ($\bar{x}$ ± SEM). Regarding the frequency of sparkling water consumption, 20/184 participants responded that they consume sparkling water almost every day (8-10 out of maximum 10-point frequency scale), while 58/184 participants responded that they consume sparkling water several times a week. In this question, the average was 3.07/10 ± 0.22 ($\bar{x}$ ± SEM). In a similar question regarding hard-Seltzer consumption frequency, the average was 2.72/10 ± 0.14 ($\bar{x}$ ± SEM). Out of all 184 participants, 68.3% prefer sparkling water with flavor as opposed to non-flavored. When asking on the frequency of beer/wine consumption our participants' average score was 3.10/10 ± 0.12 ($\bar{x}$ ± SEM), while in the question regarding consumption frequency of non-alcoholic beer/wine the respective score was even lower 1.10/10 ± 0.11 ($\bar{x}$ ± SEM) (Table 2).

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Table 2
Consumption frequency of main beverage-type

Beverage type	$\bar{x} \pm$ SEM
Soda	1.75/10 ± 0.11
Sparkling water	3.07/10 ± 0.22
Hard-Seltzer	2.72/10 ± 0.14
Beer/wine (regular)	3.10/10 ± 0.12
Beer/wine (non-alcoholic)	1.10/10 ± 0.11
Participants responded on a 0–10 Likert scale (0: never – 10: every day). Results reported as: mean of scoring values ($\bar{x}$) ± SEM.	

From a wine grape preference perspective the top three choices for red were: Cabernet Sauvignon (27.2% top choice), Pinot Noir (25.0% top choice) and Merlot 12.5% top choice), while for white were: Chardonnay (43.5% top choice), Sauvignon Blanc (18.5% top choice) and Pinot Grigio (16.3% top choice) respectively (Table 3).

Table 3
Participants order of preference for wine-grape varietals (red and white)

Type	Order of varietal ranking	(% chosen varietal top)
Red	1. Cabernet Sauvignon	27.2
	2. Pinot Noir	25.0
	3. Merlot	12.5
	4. Zinfandel	12.0
	5. Malbec	3.2
	6. Syrah	2.7
	7. Sangiovese	2.2
	8. "Other"	15.2
White	1. Chardonnay	43.5
	2. Sauvignon Blanc	18.5
	3. Pinot Grigio	16.3
	4. Moscato	13.1
	5. "Other"	8.6

Among the proposed labels for the H2O beverage, the one for the Rosé was deemed the most attractive (most popular) one. Interestingly, a mere 50% of participants noted that they look at the nutrition label and consider the relevant information when making a purchasing decision for a sparkling water beverage. Questions on frequency of consumption referring to soda-type drinks, sparkling water and hard-Seltzer aimed at discerning the extent to which these products are interesting to our participants, since the beverage tested (H2O / H_2♡) could be characterized as a beverage in the interface of sparkling water, soft beverage and Seltzer.

4.3. Participant-consumer response to H2O/H2♡ beverage

The majority of participants read the logo "H_2♡" as "H2O" recognized/pronounced: "H two oh" (131/184, i.e.: 71.2%) and stated they did not consider the label confusing (129/184, i.e.: 70.1%) (Figure 1). Of all the participants, 71% declared that they would "very likely/yes" purchase H2O, 21.5% responded they would "most likely/maybe" purchase H2O and 7.5% responded "not likely/no". More than half indicated that they would be very interested in drinking/tasting the H2O beverage (Figure 2). In terms of willingness to pay, overall, when asked about the price suggestion

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($ 9.99/ 4×16oz cans) 89/184 indicated that it is "less than expected" while 71/184 indicated that the suggested price was "about what they would expect" for such a product (Figure 2). Interestingly, the overall acceptance of the product increased further when a serving suggestion was presented to participants, arguably indicating that consumers prefer some "introduction/ education" on novel food/beverage concepts, which novel producers may then benefit from. It is worth noting that the particular cohort in this study constitutes a more challenging audience due to the greater attainment of nutrition-based knowledge and the higher level of health consciousness, which may have resulted in increased skepticism towards non-traditional foods and beverages. Additionally, 79% of participants indicated their preference for sparkling water infused with wine grape juice as opposed to infusion with dealcoholized wine (Figure 3). As part of the survey, the participants were asked a series of questions regarding the degree to which certain statements on the beverage packaging contribute to their decision-making process towards selecting and purchasing. These questions are primarily related to health-related issues and can be associated with health and wellbeing, as well as safety. More specifically, participants rated the overall importance of a series of nutritional benefits when purchasing a beverage answering via a Likert scale [least (1) to most (100); $\bar{x} \pm SEM$]. Results were as follows in terms of scoring the importance of each characteristic: No Alcohol: 45/100 ± 2.6, Number of Calories: 62.8/100 ± 2.3, No Artificial Flavors: 52.9/100 ± 2.5, No Sulfites: 39.4/100 ± 2.5, Gluten Free: 23.7/100 ± 2.4, Good Source of Vitamin B_{12}: 42.3/100 ± 2.3, Good Source of Vitamin C: 45.6/100 ± 2.2, Vegan: 24.3/100 ± 2.5, No Added Sugars: 63.5/100 ± 2.4, No Fat: 45.5/100 ± 2.5, No Trans-Fat: 59/100 ± 2.7, No Saturated Fat: 51.6/100 ± 2.6, Non-GMO: 37.5/100 ± 2.6, No Artificial Sweeteners: 56.1/100 ± 2.6, No Cholesterol: 41.3/100 ± 2.6, Electrolytes (Calcium, Ca & Potassium, K): 54/100 ± 2.3 (Table 4).

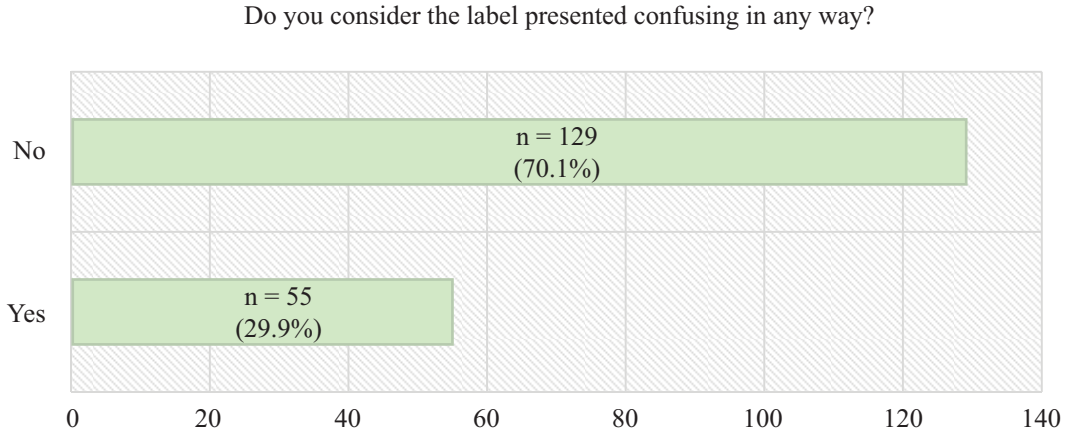

Figure 1
Participants' responses on the clarity of the label presented for "H2O/H_2♡"

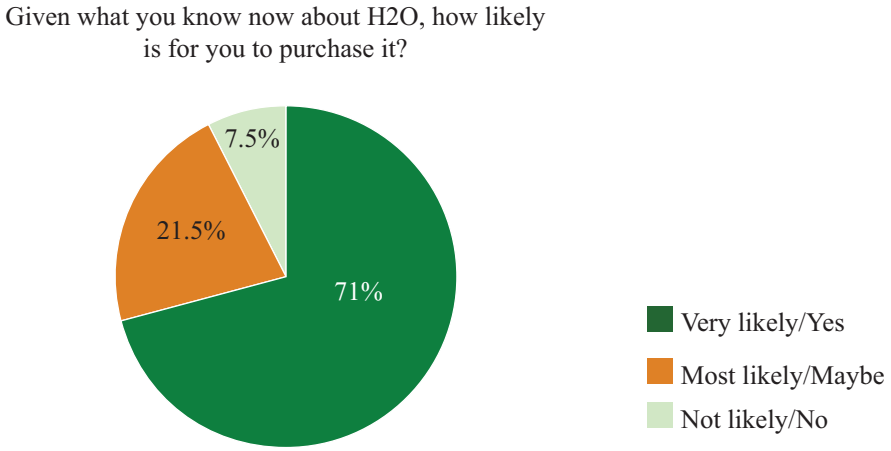

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Figure 2
Willingness to purchase "H2O/H_2♡" at suggested price

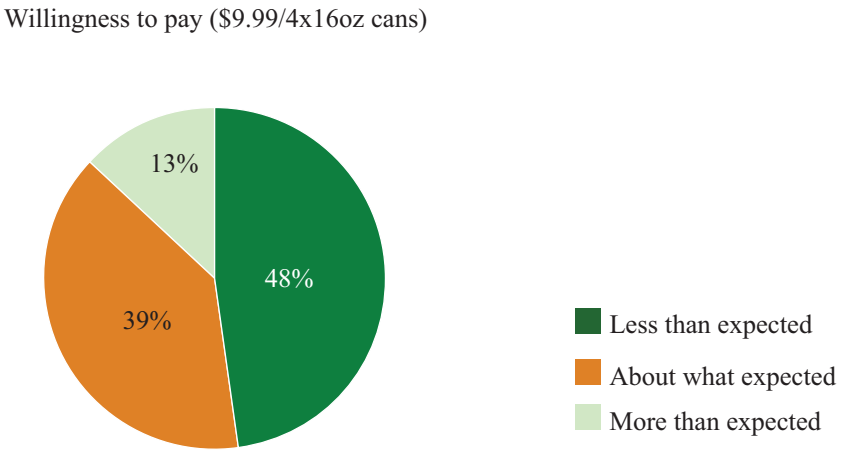

Figure 3
Extract type preference for infusion to "H2O/H_2♡"

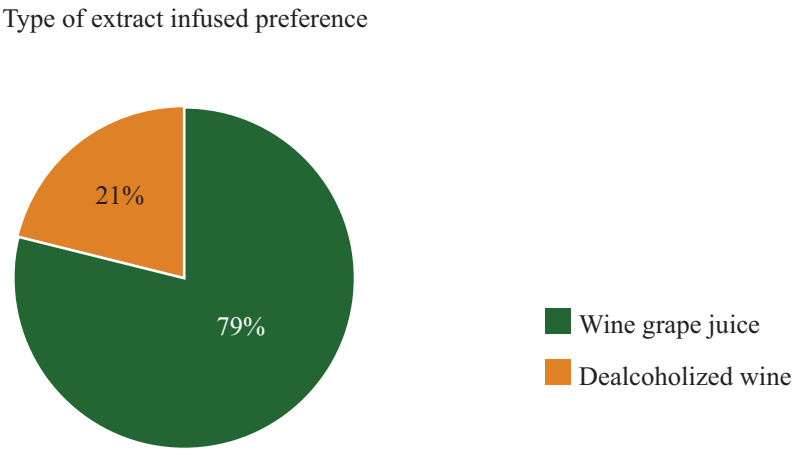

Table 4
Overall importance of nutritional benefits when purchasing a beverage

Statement	$\bar{x}$ ± SEM*	% rating > 50/100**
No Alcohol	45.0 ± 2.6	49.0
Calorie content	62.8 ± 2.3	70.7
No Artificial Flavors	52.9 ± 2.5	57.7
No Sulfites	39.4 ± 2.5	38.1
Gluten-Free	23.7 ± 2.4	24.5
Good Source of Vitamin B_{12}	42.3 ± 2.3	46.2
Good Source of Vitamin C	45.6 ± 2.2	47.3
Vegan	24.3 ± 2.5	26.1
No Added Sugars	63.5 ± 2.4	70.7
No Fat	45.5 ± 2.5	48.9
No Trans Fat	59.0 ± 2.7	62.5
No Saturated Fat	51.6 ± 2.6	54.4
Non-GMO	37.5 ± 2.6	37.5
No Artificial Sweeteners	56.1 ± 2.6	61.4
No Cholesterol	41.3 ± 2.6	43.5
Extra electrolytes (Ca & K)	54.0 ± 2.3	59.8

* Participants responded on a 0-100 Likert scale (0: least – 100: most); results are reported as: scoring mean values ($\bar{x}$) ± SEM.
** Percent of participants who rated the corresponding statement over 50/100.

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Regarding cluster score distributions, participants scored over 50/100 at the following rates: for "no alcohol" 49%, for "calorie content" 70.7%, for "no artificial flavors" 57.7%, for "no sulfites" 38.1%, for "gluten free" 24.5%, for "good source of vitamin B_{12}" 46.2%, for "good source of vitamin C" 47.3%, for "vegan" 26.1%, for "no added sugars" 70.7%, for "no fat" 48.9%, for "no trans-fat" 62.5%, for "no saturated fat" 54.4%, for "non-GMO" 37.5%, for "no artificial sweeteners" 61.4%, for "no cholesterol" 43.5% and for "electrolytes" 59.8% (Table 4).

Finally, participants were asked: "Which of the following best describes your need for such sparkling beverage [least (1) to most (100) $\bar{x} \pm$ SEM]", and were asked to score: Health benefits, Novelty, Thirst, Nutritional Composition, Attractive Package, Drink with a meal/snack/at dinner. In this question, Health benefits received a mean score of 35.7/100 ± 2.2, Novelty was 33.8/100 ± 2.3, Thirst was 32.1/100 ± 2.3, Nutritional composition was 36.8/100 ± 2.3, Attractive packaging was 41.1/100 ± 2.8 and Drink it with a meal/snack/at dinner was 41.0/100 ± 2.5. Interestingly, when looking at the score clustering distributions participants scored over 50/100 at levels of 37.5% for the motivation for purchasing for health benefits, 26.6% for novelty, 33.7% for thirst, 29.9% for nutritional composition, 35.4% for attractive packaging and 42.8% for drink with meal/snack/at dinner (Table 5). Finally, when we asked our cohort as per the personal criteria they use when making decisions regarding beverage purchases, the following ranking was produced: The majority of responses included nutrition/health as the number one criterion, closely followed by taste/flavors and cost/price. Other criteria include occasion/mood of the moment, attractiveness of the package and sustainability practices in the beverage production (supplement: Figure S2).

Table 5
Reason best describing the participants' need for such sparkling beverage [least (1) to most (100)]

Reason selected	$\bar{x} \pm$ SEM*	% of participants rating over 50/100
Health benefit(s)	35.7 ± 2.2	37.5
Novelty	33.8 ± 2.3	26.6
Thirst	32.1 ± 2.3	33.7
Nutritional composition	36.8 ± 2.3	29.9
Attractive package	41.1 ± 2.8	35.4
Drink with a meal/snack/at dinner	41.0 ± 2.5	42.8

*Mean value of 1-100 scores ± SEM.
**Percent of participants who rated the corresponding statement over 50/100.

5. DISCUSSION

In the recent years, there is steadily growing interest in the beverage industry for novel drinks that possess functional characteristics with potential to promote health and be versatile into covering a wide variety of consumer needs and demands. As alcoholic drinks and soda-type drinks are seeing a gradual decline in preference, novel beverage concepts have become more attractive both for consumers and stakeholders. In the pilot study described herein, we evaluated the initial response and acceptability of a novel premium sparkling water-based beverage infused with wine grape extract and dealcoholized wine fortified with vitamins and electrolytes by a potential consumer. The particular beverage was selected because it functions as a novel category defining (that of Soft Seltzer) product (that of Sonoma Soft Seltzer). We distributed an acceptability survey over an on-line platform to 184 healthy and health-conscious College students to discern predisposition towards a novel concept and representative product.

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As discussed in the review, a large contingency in terms of purchase is price. From a practical standpoint, price certainly constitutes a highly important determinant for food choices and purchases (Abadio Finco et al., 2010; Quester et al., 1998, Sparke et al., 2009). Typically, inverse relationships are seen between price and utility/purchase, while more specifically as price increases the utility decreases (Silva et al., 2016), although the regression equation describing that relationship is not always linear. There may be a resistance in the sharpness of the curve whereby a consumer may be willing to pay more if they consider the product worthwhile. Factors that strengthen the willingness of the consumer to pay even a relatively disproportionate rate when considering the price/utility relationship, include health benefits and/or status (Silva et al., 2016). In our study, as the price was asked at the end of the questionnaire and after the participants were familiar with the concept and health/diet related characteristics of the product, they assessed that the product was at a price that generally either considered fair or even lower than expected.

It is also evident that nutritional/health factors, including calorie content, quality of ingredients and constituents that may infer health benefit(s). Low calorie content, lack of artificial flavoring and addition of natural ingredients, as well as vitamins and minerals are generally perceived as healthy and as our results indicated significant importance is placed upon such aspects, thus influencing predisposition of the consumer towards a product, especially when it is new (Silva et al., 2016; Hoefkens et al., 2013; Jalloh et al., 2018; French et al., 2017).

As highlighted in the study by Bechoff et al., body image-conscious consumers prefer lower calorie products and hold that as an important attribute when making a purchase. This is something our results also agree with as our cohort of more educated, nutrition/health literate, young-age, mostly female individuals indicated preference for infusion of juice over dealcoholized wine. Furthermore, our results aligned with those of other studies in that a high value was placed on the antioxidant content and other relevant health-supporting aspects (Silva et al., 2016).

Our results show that our participants have a low tendency towards purchasing soda-type beverages, while they also scored relatively low on the frequency of beer/wine consumption. Nonetheless, more than half consume sparkling water fairly regularly (several times a week to every day). Their profile appears thus more conservative if approached from a dietary and health consciousness standpoint. This finding is interesting as typically, female college students are more knowledgeable than non-college females and males (Bodenlos et al., 2015). Furthermore, when College status is combined with knowledge in the field of Nutrition and Health, health consciousness and conservatism with food and beverage choices due to health and appearance concerns reasonably increases (Food and Nutrition, 2020; Bodenlos et al., 2015). There are several studies indicating that College females tend to be health-conscious (Hawley et al., 2016), while a review of the evidence showed that certain characteristics, such as being Caucasian and educated, increase both health-consciousness and awareness among females (Ramachandran et al., 2016).

Based on our results, we did see increased conservatism with choices and answers as well as interest in health aspects of the product evaluated. Further to this point, our results show that statements in support of health and natural origin of ingredients and functional properties of beverage are particularly valued by the participants. Moreover, if this is combined with the reason/motivation a participant would have to purchase this product, health benefits and packaging are the top-rated reasons. This underscores the emphasis on health and the importance of attractive packaging with regards to design as well as information conveyance. Appearance, packaging and logo presentation clearly constitute important determinants towards purchasing decisions. Interestingly, in certain consumer groups, the packaging information is not as important as health information as reported for the Bissap beverage tested in European consumers in Portugal (Food and Nutrition, 2020, Silva et al., 2016). Other studies also underline the importance of health/functional food properties seen with functional orange juice; whereby packaging information holds a relative importance higher than the promotional health claims

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(Abadio Finco et al., 2010). A potential explanation for such findings is provided by Bech-Larsen and Grunert (2003), proposing that consumers' perception on functional foods healthiness is more based on product's perceived nutritional value than health and other promotional claims *per se* (Bech-Larsen et al., 2003). Nutrition knowledge is considered a necessary, yet not sufficient factor for consumer behavior change (Dickson-Spillmann et al., 2011). Specifically in college students, factors including stress, short sleep durations, financial and time limitations, and lifestyle-related may lead to the development of unhealthy eating habits (Sogari et al., 2018), while the levels of knowledge on nutrition may affect eating habits (Rivera et al., 2020).

Health benefits function as a motivation for purchasing foods and beverages illustrated by Samoggia and Riedel (2019) and Wills (2012). Moreover, health claims are more likely to be seen more positively if associated with an ingredient maintaining an overall positive health perception, while familiarity with the ingredient increases likelihood for purchase. Compared to food items, there appears to be less literature regarding beverages, especially non-alcoholic outside of coffee and tea. Due to the often times minimal regulation, highly variable levels of knowledge paid towards health claims, misinterpretation and confusion regarding the true meaning of health claims is not uncommon (Annunziata et al., 2019). Presenting accurate information to a lay-audience in a friendly manner and with simple terms is important, both for the sake of more appropriately informing the consumer but also for a fair promotion of food and beverage products. In our study, the vast majority of participants did not find the label, logo or information of the product confusing, however we need to note that our participants are nutrition and health literate above average, so they are not necessarily representative of the general public. Our sample characteristics may render them more "demanding" consumers as per the nutritional value of their dietary choices, since having healthy eating knowledge along with current information, nutrition self-efficacy, as well as the opportunity and the motivation can help consumers in making healthy food choices and overall healthier diets (Block et al., 2011).

Consumption of energy drinks in college students has been associated with a higher BMI and unhealthy dietary behaviors including increased soda and frozen meal consumption, and decreased intakes of fruits, vegetables, milk and breakfast (Poulos et al., 2015). In a study of 800 college students in China, SSBs intake was documented to mediate the associations among sleep duration, late chronotype (tendency towards eveningness) and weight gain (Li et al., 2018). In another study of female and male student athletes, it was observed that while student athletes tended to refrain from the use of energy drinks, among those who do consume energy drinks, the level of nutrition knowledge was lower. Such findings indicate the need for nutrition education in student-athletes, specifically for energy drink consumption, since the benefits of their consumption in collegiate athletes is supported by limited evidence only (Hardy et al., 2017). The role the level of nutrition-based knowledge plays in determining beverage preference is evident from our student sample in which young health-conscious consumers reported a lower preference for soda or alcoholic beverages, and a higher preference for healthier beverage choices such as sparkling water.

Conclusively, our results indicate that in a young audience above average in nutrition literacy, the novel concept for a Soft Seltzer (namely a sparkling water-based beverage infused with wine grape juice and California dealcoholized wine, fortified with vitamins and electrolytes) has traction and interest from a conceptual aspect without actual tasting. Given that our audience was characterized by higher health and nutrition awareness and more conservative beverage choice and purchasing behavior, the acceptance rates obtained especially without tasting could be deemed significant thus indicating that a rather large portion of participants are interested in such types of products while with potential further education about potential health benefits, evidence-based findings supporting biological plausibility and introduction to actual products, it is reasonable to expect a further increased acceptability. Furthermore, the fact that our participants are College students, often met with limited financial means, can justify a stricter approach in

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terms of price acceptability and willingness to pay, albeit these rates were still very high in our obtained results. The age group of our participants, although clearly of legal alcohol drinking age, deems the group more likely to look for "actual" alcohol as opposed to "substitutes" if they decide to choose an alcohol-like beverage, which possibly explains the clear preference for wine grape juice infusion as opposed to dealcoholized wine. Finally, it is important to note that these results determine reception to only one brand, and therefore claims cannot be made for all novel products in this category. Overall, our aim for purposely choosing this cohort was to take a more conservative and strict approach so that results could be more robust and safer for the general population.

There is significant potential for further functionality and fortification of those types of beverages with selected amino acids and/or other bioactive compounds either in isolation or mixtures with antioxidant anti-inflammatory properties for improving muscle health and sarcopenia and potentially improving the gut microbiome, as well as hydration status (Maykish et al., 2020; Sikalidis & Maykish, 2020). Research in the field suggests that including other factors related to purchase could provide interesting results. The growth of premium mixers for zero-alcohol beverages made with exotic herbal ingredients seems to be a growing area. A price tag which is reflective of high-quality ingredients was rendered acceptable by consumers. The contemporary consumer is more interested in the story of the food, i.e. fair trade, organic, local, natural, less to minimally processed, authentic, sustainable, eco-friendly, and personalized, often placing a greater emphasis on quality over quantity. Therefore, novel products which combine the above criterion, with the additional potential to support health and wellbeing, are expected to have good traction with the public (Sikalidis, 2019; Sikalidis et al., 2020). The H2O Soft Seltzer as a concept aims to present a non-alcoholic beverage with nutritive value as per vitamins and electrolytes, alternative to alcoholic Hard Seltzer which in most cases provides low to minimal nutritive value. Furthermore, the lifestyle/presentation aspects are important in terms of purchase decisions (supplement: Figure S2). The findings presented here on H2O/ H_2♡ Sonoma Soft Seltzer[1] can provide useful information and guidance for product design and development for novel beverages. Results may be also useful from a nutraceutical standpoint as well as to the beverage industry in general.

6. CONCLUSIONS

The assessment of a novel sparkling water-based beverage infused with wine grape juice and California dealcoholized wine across a young college audience revealed that H2O / H_2♡ Soft Seltzer revealed an interest for its potential health benefits and novelty. The label was determined to be clear, despite being information-dense. Stronger preference was for flavors Cabernet Sauvignon and Chardonnay, while the Rosé label appeared as the most attractive to female participants. The level of acceptability was determined to be significant, especially considering the more conservative characteristics in terms of health consciousness of the participant group and the lack of a tasting session. As wine drinkers often note, the nuances of drinking wine go beyond mere alcohol and are attributed to other grape-derived ingredients. Therefore, beverage suggestions that preserve these desirable characteristics in the absence of alcohol, promoting health and satisfaction while maintaining the lifestyle of the consumer, may strongly claim a well-positioned niche in the preference of consumers.

[1] To better characterize H2O / H_2♡, and describe its niche in terms of category placement, the term Sonoma Soft Seltzer was introduced by Spyridon Zanganas who envisioned the concept of a sparkling water beverage infused with premium California dealcoholized wine, 100% pure California wine-grape juice and natural flavorings qualifying as a non-alcoholic drink [54].

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"Soft Seltzer" and "H_2♡" are both registered trademarks (™) with the United States Patent and Trademark Office (USPTO), under the serial numbers: #88767946 (Soft Seltzer) and #88731521 (H_2♡), respectively. H_2♡ is registered (®) with the #6134847 US registration number. The use of these terms in the manuscript herein is solely done for scientific purposes under the permission of the trademark holder and is not intended for advertisement purposes whatsoever.

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Conflict of Interest

Authors declare no conflict of interest.

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8. SUPPLEMENTS

Figure S1
Graphical representation of an artesian well as per United States Geological Survey (USGS, 2020)

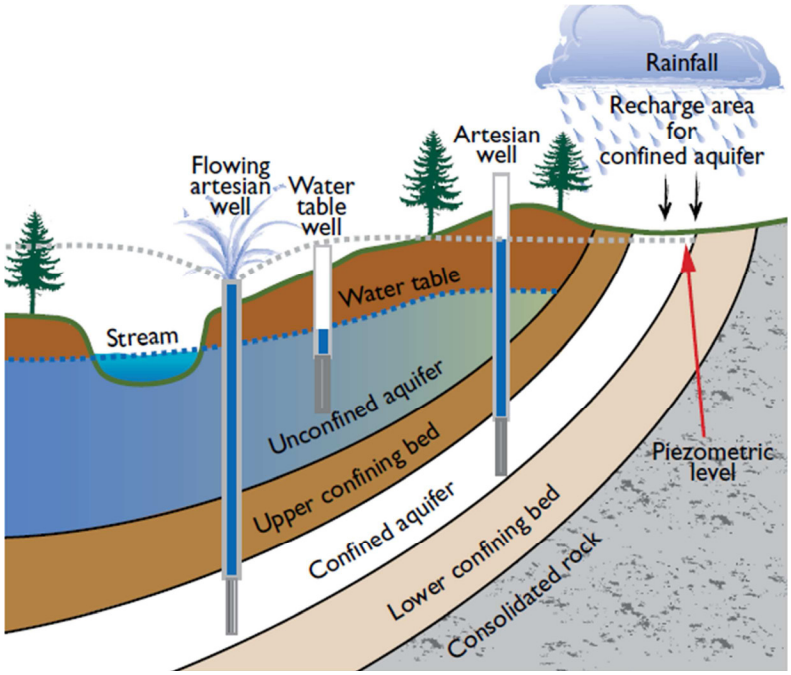

Figure S2
Graphical representation of the "H2O/H_2♡ Sonoma Soft Setzer" as launched (H2O, 2020)

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