

Title: Perception, acceptability and decision-making determinants of H₂O/H₂O⁺, Soft Seltzer, a novel non-alcoholic, low-calorie, no added sugar, no artificial sweetener, carbonated beverage to health-conscious College students in California

Authors: Angelos K. Sikalidis^{1,*}, Aleksandra S. Kristo¹, Anita Kelleher¹, Adeline Maykish¹

Affiliations:

¹Department of Food Science and Nutrition, California Polytechnic State University, San Luis Obispo, CA 93407, USA

*Correspondence: Dr. Angelos K. Sikalidis, California Polytechnic State University, 1 Grand Avenue, Bldg: 11, Rm: 241, San Luis Obispo, CA 93407, USA
E-mail: asikalid@calpoly.edu, Tel: +1-805-756-2618, Fax: +1-805-756-1146.

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 marking a decline. Thus, there is a growing interest for novel beverages, especially when creating healthy options aiming to support health via enhanced functional food properties. Furthermore, understanding how the public perceives and makes purchasing decisions towards such options is also of key importance. An effort in functional beverages is the H₂O/H₂O⁺ drink, a novel Soft Seltzer non-alcoholic beverage concept. The Soft Seltzer category is defined by this product as there is nothing similar in the market currently. It is a sparkling water-based low calorie, no added sugar, no artificial sweetener, non-alcoholic, carbonated beverage infused with varietal wine grape juice and California dealcoholized wine, natural flavor extracts, and enriched with vitamins B₁₂ and C, as well as potassium and calcium. In our pilot study herein we performed a perception and acceptability study to health-conscious College students in California. More specifically, 184 healthy college students were given an on-line acceptability questionnaire with 38 questions to evaluate the concept of the H₂O beverage. Our participants indicated that they would be interested in purchasing such a beverage at a combined 71% rate, while in terms of willingness to pay, a suggested price for \$9.99/4x16oz cans was deemed less or about what expected for a combined 87% of the study sample. Our results taken together show that there is significant 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 would complete the picture regarding this novel product. 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.

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

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, as average calorie intake for Americans over the age of two increased by 150-300 kcal/day, depending on age and sex, between 1970-2000, it has been estimated that as much as 50% of this intake could be due to the consumption of calorie-dense beverages [1-8]. 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 [2-12].

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) [13,14]. 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 [15]. 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 [16], and inconclusive evidence on health effects related to obesity, diabetes and cardiovascular disease [17].

In 2018, alcohol consumption fell by 1.5% on global scale, according to International Wine Spirits Record [18]. 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 [18,19]. According to a recent report by Klynveld Peat Marwick Goerdeler International Cooperative (KPMG), a global network providing financial services [19], as well as mounting evidence [20-22], 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 [19-21]. 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%) [15].

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 [22]. 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 [23].

The Dietary Guidelines for Americans provide limited recommendations for beverages except for milk, 100% fruit juice, and alcohol [24]. 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 [25].

Innovative beverage products that fulfil health and wellness support, premiumization, convenience and sustainability seem to be addressing the primary modern customer desires [26]. 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) or adhering to religious practices (lent, fasting). The modern approach for novel products in the beverage sector aims to address consumers with strong statement/beliefs such as veganism, non-GMO, ecologically and sustainability sensitive [26]. 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 [26,27].

In our study herein, we evaluated consumer predisposition and acceptability of a novel sparkling water-based beverage the H₂O (H₂♡) 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 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.

Materials and Methods

Beverage assessed

The beverage assessed is the H₂O/H₂O⁺ Sonoma Soft Seltzer, 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 to the natural sugars found in the wine grape juice used to infuse the beverage.

Participants, Questionnaire and Delivery

This was an observational acceptability consumer predisposition to novel product study, 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, 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 [28], indicating 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. The questionnaire developed was such so that participants evaluate their purchasing determinants as well as likelihood of purchasing the given product, by using five-point Likert scale. An example of a profile given to participants to perform the evaluation is presented in Figure 1. Questions were both quantitative (including numerical scoring), as well as qualitative including narrative response as an answer, while the delivery of the questionnaire was on-line.

Analysis

Given the fact that acceptability of foods and beverages is dependent on a multi-factorial array of determinants with varying importance to different consumers, a conjoint analysis was selected as a working frame for the current study. This methodological approach is well established scientifically, utilized extensively and widely in food/beverage research, while its efficacy is demonstrated in studying consumers' preferences and choice factors with numerous examples including pineapple juice [29], functional foods [30], organic foods [31] and wines [32,33].

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).

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.

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 B₁₂ and C, as well as electrolytes calcium and potassium.

Consumer-participant profile

Our participants were a group comprised of 184 college students of whom 148 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 the relationship with technology in terms of making choices and decisions we wanted to have a 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.

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 is a response indicative of the level of health consciousness seen in our participants and quite possibly an effect of their level of interest and education in Nutrition. In this question, the average was $1.75/10 \pm 0.11$ ($\bar{x} \pm \text{SEM}$). 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 $3.07/10 \pm 0.22$ ($\bar{x} \pm \text{SEM}$). In a similar question regarding hard-Seltzer consumption frequency, the average was $2.72/10 \pm 0.14$ ($\bar{x} \pm \text{SEM}$). 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 $3.10/10 \pm 0.12$ ($\bar{x} \pm \text{SEM}$), while in the question regarding consumption frequency of non-alcoholic beer/wine the respective score was even lower $1.10/10 \pm 0.11$ ($\bar{x} \pm \text{SEM}$) (Table 2).

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).

Among the proposed labels for the H₂O beverage, the one from 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 towards 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 / H₂♥) could be characterized as a beverage in the interface of sparkling water, soft beverage and Seltzer.

Participant-consumer response to H₂O/H₂♥ beverage

The majority of participants reads the logo “H₂♥” as “H₂O” recognized/pronounced “aitch two oh” (131/184, i.e.: 71.2%) and stated that did not consider the label confusing (129/184, i.e.: 70.1%) (Figure 2). Of all participants 71% declared that they would “very likely/yes” purchase H₂O, 21.5% responded they would purchase H₂O “most likely/maybe” and 7.5% responded “not likely/no”. More than half indicated that they would be very interested in drinking/tasting the H₂O beverage (Figure 3). In terms of willingness to pay, overall, when asked about the price suggestion (\$ 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 3). Interestingly, the acceptability of the product increased further when a serving suggestion was presented to the participants, arguably indicating that the consumers would benefit from some “introduction/education” on novel food/beverage concepts, especially when considering that the particular cohort constitutes a more challenging audience due to the level of knowledge and skepticism from a nutritional aspect and health consciousness towards non-traditional beverages. Additionally, 79% of participants indicated their preference for a sparkling water infused with wine grape juice as opposed to infusion with dealcoholized wine (Figure 4). As part of the survey, the participants were asked a series of questions regarding the degree to which certain statement 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); $\bar{x} \pm \text{SEM}$]. Results were as follows in terms of scoring the importance of each characteristic: No Alcohol: 45/100 \pm 2.6, Number of Calories: 62.8/100 \pm 2.3, No Artificial Flavors: 52.9/100 \pm 2.5, No Sulfites: 39.4/100 \pm 2.5, Gluten Free: 23.7/100 \pm 2.4, Good Source of Vitamin B₁₂: 42.3/100 \pm 2.3, Good Source of Vitamin C: 45.6/100 \pm 2.2, Vegan: 24.3/100 \pm 2.5, No Added Sugars: 63.5/100 \pm 2.4, No Fat: 45.5/100 \pm 2.5, No Trans-Fat: 59/100 \pm 2.7, No Saturated Fat: 51.6/100 \pm 2.6, Non-GMO: 37.5/100 \pm 2.6, No Artificial Sweeteners: 56.1/100 \pm 2.6, No Cholesterol: 41.3/100 \pm 2.6, Electrolytes (Calcium, Ca & Potassium, K): 54/100 \pm 2.3 (Table 4).

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 B₁₂” 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) $\bar{x} \pm \text{SEM}$], 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 \pm 2.2,

Novelty was $33.8/100 \pm 2.3$, Thirst was $32.1/100 \pm 2.3$, Nutritional composition was $36.8/100 \pm 2.3$, Attractive packaging was $41.1/100 \pm 2.8$ and Drink it with a meal/snack/at dinner was $41.0/100 \pm 2.5$. 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 actual personal criteria, they use for making decisions regarding beverage purchases, the following ranking was produced: The majority of responses included nutrition/health as 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: SL1).

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 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.

A contingency in terms of purchase is price. From a practical standpoint, price certainly constitutes a highly important determinant for food choices and purchases. There are several acceptability studies that have deemed price as the highest importance attribute by consumers for various products [29,33]. Other studies have revealed price as being the major constraining factor for non-consumers who see cost as a barrier for purchasing functional beverages [34]. Typically, inverse relationships are seen between price and utility/purchase, while more specifically as price increases the utility decreases [27], 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 [27]. 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.

Therefore, in addition to the factor “price”, consumers’ prospect to purchase is significantly affected by a series of 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. Several studies have underlined the importance health benefits of beverages may have

on consumer predisposition towards a beverage in agreement with our findings and assessment [27, 35-37].

Work by Beckoff et al., investigated customer clustering using merely acceptance [38]. The analyses demonstrated varying clusters relevant to preference of syrups, infusions, or both and this was further associated to color and taste attributes and concomitant chemical ingredients. Taking into consideration those analyses it was concluded that body image-aware consumers might prefer infusions, since calories tend to constitute the most critical quality. This is something our results also agree with in terms of a more educated, nutrition/health literate, young age, mostly female, and the indicated preference to infusion of juice as opposed to dealcoholized wine. Furthermore, our results in the high value placed on antioxidant and other relevant health supporting information is in line with results from other studies [27] which demonstrate the value of antioxidant information, consistent with the concept of infusion.

Our results show that our participants have low tendency towards purchasing soda-type beverages, while they also score 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 [39]. Furthermore, when College status is combined with knowledge in the field of Nutrition and Health reasonably increases health consciousness and conservatism with food and beverage choices due to health and appearance concerns [24, 39]. There are several studies indicating that College females tend to be health-conscious [40], while a review of the evidence showed that certain characteristics such as being Caucasian and educated increase health-consciousness and awareness in females [41].

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 a Bissap type of beverage tested in European consumers in Portugal [24]. 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 [29]. 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* [30]. Nutrition knowledge is considered a necessary, yet not sufficient factor for consumer behavior change [42]. 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 [43], while the levels of knowledge on nutrition may affect eating habits [44].

There are several studies indicating that health benefits function as a motivation for purchasing foods and beverages. A study by Samoggia and Riedel [45] concluded that consumers consume coffee primarily due to its perceived energetic effects and its potential

health benefits. Coffee consumption is still price-driven, but consumers are interested in purchasing coffee with associated health claims. A comprehensive review 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, functional/active ingredient emphasized [46]. 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. Interestingly, a recent study in Italy examining the interest of consumers in health claims and the influence of health claims on purchasing decisions demonstrated that there is low attention and knowledge level pertinent to health claims, while misinterpretation and confusion as per the real meaning of those in scientific terms is not uncommon [47]. Therefore, presenting accurate information in a lay-audience friendly manner and with simple terms is important both for 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 [48].

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 [49]. 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 [50]. In another study of female and male students, it was observed that student athletes tended to refrain from the use of energy drinks, while among students consuming 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 [51]. The role of nutrition knowledge level in determining beverage preference is evident in our student sample of young health-conscious consumers who report a lower preference for soda or alcoholic beverages, and a higher preference for healthier beverage choices such as sparkling water.

Conclusively, in the study presented here, our results taken together indicate that in a young audience literate in nutrition above average, a 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 terms of price acceptability and willingness to pay, albeit these rates were still very high in our obtained results. Moreover, 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. 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 [52,53]. 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 reflective of high-quality ingredients renders consumers willing to pay for. The contemporary consumer is more interested in the story of the food, fair trade, organic, local, natural, less to minimally processed, authentic, sustainable, eco-friendly, and personalized, often with an emphasis on quality versus quantity so novel products combining the above with the potential to support health and wellbeing are expected to have good traction with the public [26]. 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/ H₂♥ Sonoma Soft Seltzer¹ 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.

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 / H₂♥ Soft Seltzer revealed an interest for its potential health benefits and novelty. The label was determined to be clear, even though 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 / H₂♥, 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].

Disclaimer

“Soft Seltzer” and “H₂♡” are both registered trademarks (™) with the United States Patent and Trademark Office (USPTO), under the serial numbers: #88767946 (Soft Seltzer) and #88731521 (H₂♡), respectively. H₂♡ 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.

Acknowledgments

The authors would like to acknowledge and thank for the access to product information and informative discussions, the Georgos Greek Wine Co., and Deerfield Ranch Winery in Kenwood, Sonoma Valley, California.

Conflict of Interest

Authors declare no conflict of interest.

Funding

Support and APC coverage were through an FSN-382 grant awarded to Dr. Angelos Sikalidis.

References

1. Popkin, B.M.; Armstrong, L.E.; Bray, G.M.; Caballero, B.; Frei, B.; Willett, W.C. A new proposed guidance system for beverage consumption in the United States [published correction appears in *Am J Clin Nutr.* 2007 Aug;86(2):525]. *Am J Clin Nutr.* **2006**, *83*, 529-542.
2. de Ruyter, J.C.; Olthof, M.R.; Seidell, J.C.; Katan, M.B. A Trial of Sugar-free or Sugar-Sweetened Beverages and Body Weight in Children. *N. Engl. J. Med.* **2012**, *367*, 1397–1406, doi:10.1056/NEJMoa1203034.
3. Jin, R.; Le, N.A.; Liu, S.; Epperson, M.F.; Ziegler, T.R.; Welsh, J.A.; Jones, D.P.; McClain, C.J.; Vos, M.B. Children with NAFLD are more sensitive to the adverse metabolic effects of fructose beverages than children without NAFLD. *J. Clin. Endocrinol. Metab.* **2012**, *97*, doi:10.1210/jc.2012-1370.
4. Papandreou, D.; Karabouta, Z.; Pantoleon, A.; Rousso, I. Investigation of anthropometric, biochemical and dietary parameters of obese children with and without non-alcoholic fatty liver disease. *Appetite* **2012**, *59*, 939–944, doi:10.1016/j.appet.2012.09.006.
5. Welsh, J.A.; Sharma, A.; Cunningham, S.A.; Vos, M.B. Consumption of added sugars and indicators of cardiovascular disease risk among US adolescents. *Circulation* **2011**, *123*, 249–57, doi:10.1161/CIRCULATIONAHA.110.972166.
6. JN, D.; EE, V.; MJ, W.; GDC, B.; ML, C.; GQ, S.; MI, G. The relation of sugar intake to βcell function in overweight Latino children. *Am. J. Clin. Nutr.* **2005**, *82*, 1004–1010.
7. Durão, C.; Severo, M.; Oliveira, A.; Moreira, P.; Guerra, A.; Barros, H.; Lopes, C. Evaluating the effect of energy-dense foods consumption on preschool children’s body mass index: a prospective analysis from 2 to 4 years of age. *Eur. J. Nutr.* **2015**, *54*, 835–843, doi:10.1007/s00394-014-0762-4.
8. Mirmiran, P.; Bahadoran, Z.; Delshad, H.; Azizi, F. Effects of energy-dense nutrient-poor snacks on the incidence of metabolic syndrome: A prospective approach in Tehran Lipid and Glucose Study. *Nutrition* **2014**, *30*, 538–543, doi:10.1016/j.nut.2013.09.014.

9. Vilela, S.; Oliveira, A.; Ramos, E.; Moreira, P.; Barros, H.; Lopes, C. Association between energy-dense food consumption at 2 years of age and diet quality at 4 years of age. *Br. J. Nutr.* **2014**, *111*, 1275–1282, doi:10.1017/S0007114513003620.
10. Yari, Z.; Cheraghpour, M.; Aghamohammadi, V.; Alipour, M.; Ghanei, N.; Hekmatdoost, A. Energy-dense nutrient-poor snacks and risk of non-alcoholic fatty liver disease: A case-control study in Iran. *BMC Res. Notes* **2020**, *13*, doi:10.1186/s13104-020-05063-9.
11. Chandran, U.; McCann, S.E.; Zirpoli, G.; Gong, Z.; Lin, Y.; Hong, C.C.; Ciupak, G.; Pawlish, K.; Ambrosone, C.B.; Bandera, E. V. Intake of energy-dense foods, fast foods, sugary drinks, and breast cancer risk in African American and European American women. *Nutr. Cancer* **2014**, *66*, 1187–1199, doi:10.1080/01635581.2014.951737.
12. Sikalidis, A.K.; Fitch, M.D.; Fleming, S.E. Risk of colonic cancer is not higher in the obese Lepob mouse model compared to lean littermates. *Pathol. Oncol. Res.* **2013**, *19*, 867–874, doi:10.1007/s12253-013-9656-7.
13. Rehm, C.D.; Peñalvo, J.L.; Afshin, A.; Mozaffarian, D. Dietary intake among US Adults, 1999-2012. *JAMA - J. Am. Med. Assoc.* **2016**, *315*, 2542–2553, doi:10.1001/jama.2016.7491.
14. Kit, B.K.; Fakhouri, T.H.I.; Park, S.; Nielsen, S.J.; Ogden, C.L. Trends in sugar-sweetened beverage consumption among youth and adults in the United States: 1999-2010. *Am. J. Clin. Nutr.* **2013**, *98*, 180–188, doi:10.3945/ajcn.112.057943.
15. Johnson, R.K.; Lichtenstein, A.H.; Anderson, C.A.M.; Carson, J.A.; Després, J.-P.; Hu, F.B.; Kris-Etherton, P.M.; Otten, J.J.; Towfighi, A.; Wylie-Rosett, J. Low-Calorie Sweetened Beverages and Cardiometabolic Health: A Science Advisory From the American Heart Association. *Circulation* **2018**, *138*, e126–e140, doi:10.1161/CIR.0000000000000569.
16. Mishra, A.; Ahmed, K.; Froghi, S.; Dasgupta, P. Systematic review of the relationship between artificial sweetener consumption and cancer in humans: analysis of 599,741 participants. *Int. J. Clin. Pract.* **2015**, *69*, 1418–1426, doi:10.1111/ijcp.12703.
17. Pereira, M.A. Diet beverages and the risk of obesity, diabetes, and cardiovascular disease: A review of the evidence. *Nutr. Rev.* **2013**, *71*, 433–440, doi:10.1111/nure.12038.
18. IWSR Worldwide Alcohol Consumption Declines -1.6 %. *Press Release* **2019**, *i*, 2019.
19. Colbert, R. 5 Trends Transforming the Beverage Industry. *KPMG Blog* **2019**.
20. Pharis, M.L.; Colby, L.; Wagner, A.; Mallya, G. Sales of healthy snacks and beverages following the implementation of healthy vending standards in City of Philadelphia vending machines. *Public Health Nutr.* **2018**, *21*, 339–345, doi:10.1017/S1368980017001914.
21. Hua, S. V.; Kimmel, L.; Van Emmeren, M.; Taherian, R.; Remer, G.; Millman, A.; Ickovics, J.R. Health Promotion and Healthier Products Increase Vending Purchases: A Randomized Factorial Trial. *J. Acad. Nutr. Diet.* **2017**, *117*, 1057–1065, doi:10.1016/j.jand.2016.12.006.
22. Jones, A.C.; Kirkpatrick, S.I.; Hammond, D. Beverage consumption and energy intake among Canadians: Analyses of 2004 and 2015 national dietary intake data. *Nutr. J.* **2019**, *18*, 60, doi:10.1186/s12937-019-0488-5.
23. Government of Canada Healthy eating habits – Canada’s Food Guide Available online: <https://food-guide.canada.ca/en/healthy-eating-recommendations/> (accessed on Jul 31, 2020).

24. Food & Nutrition | health.gov Available online: <https://health.gov/our-work/food-nutrition> (accessed on Jul 31, 2020).
25. Ferruzzi, M.G.; Tanprasertsuk, J.; Kris-Etherton, P.; Weaver, C.M.; Johnson, E.J. Perspective: The Role of Beverages as a Source of Nutrients and Phytonutrients. *Adv. Nutr.* **2020**, *11*, 507–523, doi:10.1093/advances/nmz115.
26. Sikalidis, A.K. From Food for Survival to Food for Personalized Optimal Health: A Historical Perspective of How Food and Nutrition Gave Rise to Nutrigenomics. *J. Am. Coll. Nutr.* **2019**, *38*, 84–95.
27. Silva, A.; Franco, M.; Mady, C.; Pallet, D.; Tomlins, K.; Bennett, B.; Pintado, M.; Sottomayor, M. Drivers of Acceptance of a New Beverage in Europe. *Beverages* **2016**, *2*, 12, doi:10.3390/beverages2020012.
28. Kraft, F.B.; Goodell, P.W. Identifying the health conscious consumer. *J. Health Care Mark.* **1993**, *13*, 18–25.
29. Abadio Finco, F.D.B.; Deliza, R.; Rosenthal, A.; Silva, C.H.O. The effect of extrinsic product attributes of pineapple juice on consumer intention to purchase. *J. Int. Food Agribus. Mark.* **2010**, *22*, 125–142, doi:10.1080/08974430903372963.
30. Bech-Larsen, T.; Grunert, K.G. The perceived healthiness of functional foods: A conjoint study of Danish, Finnish and American consumers' perception of functional foods. *Appetite* **2003**, *40*, 9–14, doi:10.1016/S0195-6663(02)00171-X.
31. Mesías, F.J.; Martínez-Carrasco, F.; Martínez, J.M.; Gaspar, P. Functional and organic eggs as an alternative to conventional production: A conjoint analysis of consumers' preferences. *J. Sci. Food Agric.* **2011**, *91*, 532–538, doi:10.1002/jsfa.4217.
32. Gil, J.M. Consumer preferences for wine attributes: A conjoint approach. *Artic. Br. Food J.* **1997**, doi:10.1108/00070709710158825.
33. Quester, P.G.; Smart, J. The influence of consumption situation and product involvement over consumers' use of product attribute. *J. Consum. Mark.* **1998**, *15*, 220–238, doi:10.1108/07363769810219107.
34. Sparke, K.; Menrad, K. Cross-European and Functional Food related consumer segmentation for new product development. *J. Food Prod. Mark.* **2009**, *15*, 213–220.
35. Hoefkens, C.; Verbeke, W. Consumers' health-related motive orientations and reactions to claims about dietary calcium. *Nutrients* **2013**, *5*, 82–96, doi:10.3390/nu5010082.
36. Jalloh, M.F.; Williams, A.R.; Jalloh, M.B.; Sengeh, P.; Saquee, G.; Bartram, J. Consumer perceptions and purchasing of packaged water products in Sierra Leone. *Pan Afr. Med. J.* **2018**, *30*, doi:10.11604/pamj.2018.30.262.13676.
37. French, S.A.; Rydell, S.A.; Mitchell, N.R.; Michael Oakes, J.; Elbel, B.; Harnack, L. Financial incentives and purchase restrictions in a food benefit program affect the types of foods and beverages purchased: Results from a randomized trial. *Int. J. Behav. Nutr. Phys. Act.* **2017**, *14*, doi:10.1186/s12966-017-0585-9.
38. Bechoff, A.; Cissé, M.; Flidel, G.; Declémy, A.-L.; Ayessou, N.; Akissoe, N.; Touré, C.; Bennett, B.; Pintado, M.; Pallet, D.; *et al.* Relationships between anthocyanins and other compounds and sensory acceptability of Hibiscus drinks. *Food Chem.* **2014**, *148*, 112–119.
39. Bodenlos, J.S.; Wells, S.Y.; Noonan, M.; Mayrsohn, A. Facets of dispositional mindfulness and health among college students. *J. Altern. Complement. Med.* **2015**, *21*, 645–652, doi:10.1089/acm.2014.0302.

40. Hawley, L.D.; MacDonald, M.G.; Wallace, E.H.; Smith, J.; Wummel, B.; Wren, P.A. Baseline assessment of campus-wide general health status and mental health: Opportunity for tailored suicide prevention and mental health awareness programming. *J. Am. Coll. Heal.* **2016**, *64*, 174–183, doi:10.1080/07448481.2015.1085059.
41. Ramachandran HJ, Wu VX, Kowitlawakul Y, Wang W. Awareness, knowledge and healthy lifestyle behaviors related to coronary heart disease among women: An integrative review. *Heart Lung*. 2016;45(3):173-185. doi:10.1016/j.hrtlng.2016.02.004.
42. Dickson-Spillmann, M.; Siegrist, M. Consumers' knowledge of healthy diets and its correlation with dietary behaviour. *J. Hum. Nutr. Diet.* **2011**, *24*, 54–60, doi:10.1111/j.1365-277X.2010.01124.x.
43. Sogari, G.; Velez-Argumedo, C.; Gómez, M.I.; Mora, C. College students and eating habits: A study using an ecological model for healthy behavior. *Nutrients* **2018**, *10*, doi:10.3390/nu10121823.
44. Rivera, P.; Tovar, R.; Ramírez-López, M.T.; Navarro, J.A.; Vargas, A.; Suárez, J.; Fonseca, F.R. de Sex-Specific Anxiety and Prefrontal Cortex Glutamatergic Dysregulation Are Long-Term Consequences of Pre-and Postnatal Exposure to Hypercaloric Diet in a Rat Model. *Nutrients* **2020**, *12*, doi:10.3390/nu12061829.
45. Samoggia, A.; Riedel, B. Consumers' perceptions of coffee health benefits and motives for coffee consumption and purchasing. *Nutrients* **2019**, *11*, doi:10.3390/nu11030653.
46. Wills, J.M.; Storcksdieck genannt Bonsmann, S.; Kolka, M.; Grunert, K.G. European consumers and health claims: attitudes, understanding and purchasing behaviour. *Proc. Nutr. Soc.* **2012**, *71*, 229–236, doi:10.1017/s0029665112000043.
47. Annunziata, A.; Mariani, A. Do consumers care about nutrition and health claims? Some evidence from Italy. *Nutrients* **2019**, *11*, doi:10.3390/nu11112735.
48. Block, L.G.; Grier, S.A.; Childers, T.L.; Davis, B.; Ebert, J.E.J.; Kumanyika, S.; Laczniak, R.N.; Machin, J.E.; Motley, C.M.; Peracchio, L.; et al. From Nutrients to Nurturance: A Conceptual Introduction to Food Well-Being. *J. Public Policy Mark.* **2011**, *30*, 5–13, doi:10.1509/jppm.30.1.5.
49. Poulos, N.S.; Pasch, K.E. Energy drink consumption is associated with unhealthy dietary behaviours among college youth. *Perspect. Public Health* 2015, *135*, 316–321.
50. Li, W.; Wu, M.; Yuan, F.; Zhang, H. Sugary beverage consumption mediates the relationship between late chronotype, sleep duration, and weight increase among undergraduates: A cross-sectional study. *Environ. Health Prev. Med.* **2018**, *23*, 63, doi:10.1186/s12199-018-0754-8.
51. Hardy, R.; Kliemann, N.; Evansen, T.; Brand, J. Relationship Between Energy Drink Consumption and Nutrition Knowledge in Student-Athletes. *J. Nutr. Educ. Behav.* **2017**, *49*, 19-26.e1, doi:10.1016/j.jneb.2016.08.008.
52. Maykish A, Sikolidis AK. (2020) Utilization of Hydroxyl-Methyl Butyrate, Leucine, Lysine, Glutamine and Arginine Supplementation in Nutritional Management of Sarcopenia – Implications and Clinical Considerations for Type 2 Diabetes Mellitus Risk Modulation. *J Pers Med.* 10(1)19. doi:10.3390/jpm10010019.
53. Sikolidis, A.K.; Maykish, A. The Gut Microbiome and Type 2 Diabetes Mellitus: Discussing A Complex Relationship. *Biomedicines* **2020**, *8*, 8, doi:10.3390/biomedicines8010008.

54. H2O/ H2O Seltzer 0.0% - The World's 1st Wine-Infused Soft Seltzer – No Alcohol Soft Seltzer | The World's 1st Wine-Infused Sparkling Beverage with 0.0% Alcohol - Sonoma, CA, 95452 Available online: <https://h2oseltzer.com/> (accessed on Jul 17, 2020).
55. U.S. Geological Survey (USGS) Artesian water and artesian wells Available online: https://www.usgs.gov/special-topic/water-science-school/science/artesian-water-and-artesian-wells?qt-science_center_objects=0#qt-science_center_objects (accessed on Jul 23, 2020).

Tables & Figures

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

Table 2. Consumption frequency of main beverage-type.	
Beverage type	$\bar{x} \pm \text{SEM}$
Soda	1.75/10 \pm 0.11
Sparkling water	3.07/10 \pm 0.22
Hard-Seltzer	2.72/10 \pm 0.14
Beer/wine (regular)	3.10/10 \pm 0.12
Beer/wine (non-alcoholic)	1.10/10 \pm 0.11
Participants responded on a 0-10 Likert scale (0: never – 10: every day).	
Results reported as: mean of scoring values (\bar{x}) \pm SEM.	

Table 3. Participants order of preference for wine-grape varieties (red and white).		
Type	Order of varietal ranking	(% chosen varietal top)
<u>Red</u>	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
<u>White</u>	1. Chardonnay	43.5
	2. Sauvignon Blanc	18.5
	3. Pinot Grigio	16.3
	4. Moscato	13.1
	5. “Other”	8.6

Table 4. Overall importance of nutritional benefits when purchasing a beverage.		
Statement	$\bar{x} \pm \text{SEM}^*$	% rating > 50/100**
No Alcohol	45.0 \pm 2.6	49.0
Calorie content	62.8 \pm 2.3	70.7
No Artificial Flavors	52.9 \pm 2.5	57.7
No Sulfites	39.4 \pm 2.5	38.1
Gluten-Free	23.7 \pm 2.4	24.5
Good Source of Vitamin B ₁₂	42.3 \pm 2.3	46.2
Good Source of Vitamin C	45.6 \pm 2.2	47.3
Vegan	24.3 \pm 2.5	26.1
No Added Sugars	63.5 \pm 2.4	70.7
No Fat	45.5 \pm 2.5	48.9
No Trans Fat	59.0 \pm 2.7	62.5
No Saturated Fat	51.6 \pm 2.6	54.4
Non-GMO	37.5 \pm 2.6	37.5
No Artificial Sweeteners	56.1 \pm 2.6	61.4
No Cholesterol	41.3 \pm 2.6	43.5
Extra electrolytes (Ca & K)	54.0 \pm 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}) \pm SEM.		
**Percent of participants who rated the corresponding statement over 50/100.		

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

Reason	$\bar{x} \pm \text{SEM}^*$	% 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 \pm SEM.

**Percent of participants who rated the corresponding statement over 50/100.

Q4. How frequently do you consume sparkling water? [Never (1) to Every-day (10)].



- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Q7. Do you prefer sparkling water WITH flavor or WITHOUT (1 - 100)?

0 10 20 30 40 50 60 70 80 90 100

WITH flavor ()	
WITHOUT flavor ()	

Q16. PLEASE TAKE A LOOK AT THE FOLLOWING LOGO:



- How would you read the logo displayed above?

Q17. PLEASE TAKE A LOOK AT THE FOLLOWING PRODUCT:



- What do you think the displayed product above is?

Figure 1. Example of survey questions layout.

Do you consider the label presented confusing in any way?

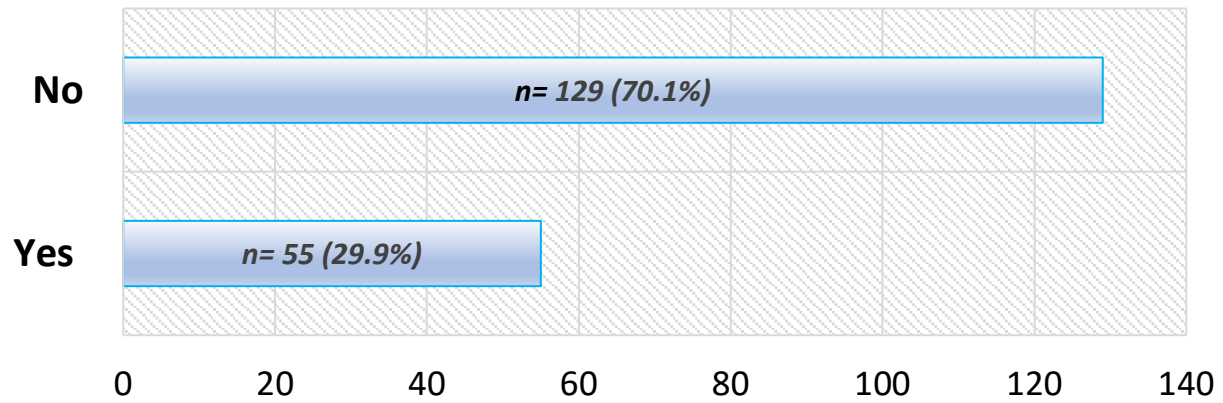


Figure 2. Participants' responses on the clarity of the label presented for "H₂O/H₂♡".

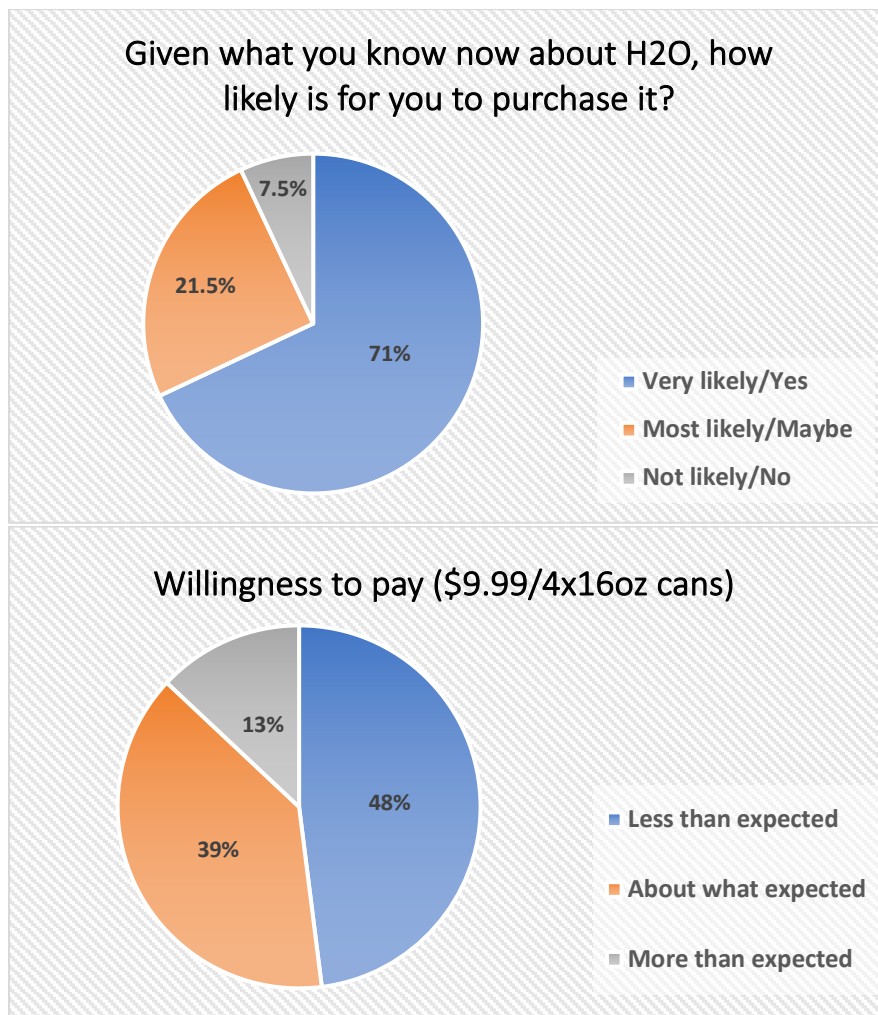


Figure 3. Willingness to purchase "H₂O/H₂♡" at suggested price.

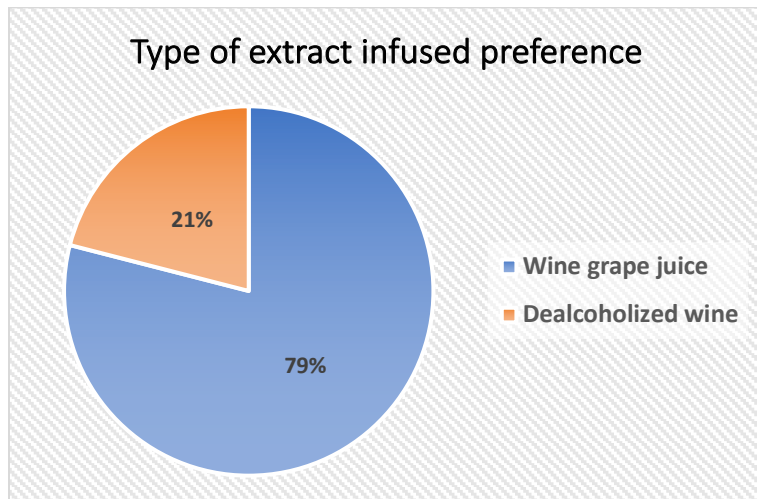


Figure 4. Extract type preference for infusion to “H₂O/H₂♡”.



Figure 5. Presentation of the “H₂O/H₂♡ Soft Seltzer” concept to the survey participants with 8 varietal flavors (Pinot Noir; Chardonnay; Zinfandel; Sauvignon Blanc; Cabernet Sauvignon; Moscato; Rosé; Merlot).

Supplement

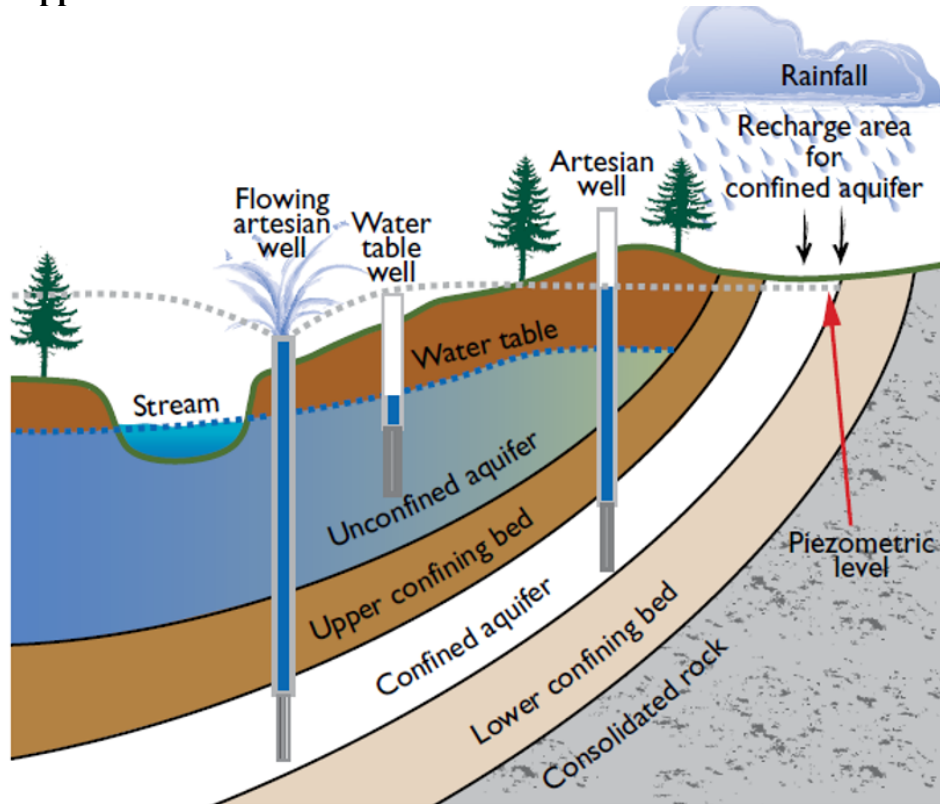


Figure S1. Graphical representation of an artesian well as per United States Geological Survey (USGS) [55].



Figure S2. Graphical representation of the “H2O/H2♥ Sonoma Soft Setzer” as launched [54].

Supplemental List: SL1

Qualitative responses/comments on the question (representative sample of responses):

- ***When you are buying a beverage, what is/are your primary/main criteria for selecting which beverage to purchase?***

#1

“I usually try new drinks based on the health benefits that come with consuming them, and they also can’t be too unhealthy. For the most part, I lookout for vitamin B12 (for context, I am a vegetarian), though other vitamins and minerals also influence my choice. Cost is an important factor for me. And, finally, the attractiveness of the packaging also influences my choice. I would suggest putting more emphasis around the health benefits of the drink (especially a side by side comparison with actual alcohol). Maybe you could go in depth about what these vitamins do for your body (i.e. vitamin B12 is a good source of energy... therefore this drink gives you energy)”.

#2

“I am very interested in reading the nutritional facts and its ingredients on all beverages, especially on sparkling water since there could be an assortment of ways the beverage is made. Usually, the reason many drinks sparkling water is for a healthier alternative to soda. I think it’s important for the flavor to be naturally derived when it is added, I personally enjoy flavored sparkling water. So when I look for a beverage like sparkling water, I look for the most natural and healthier alternatives possible, meaning no calories, sugar, or artificial additives not necessarily looking for a benefit like vitamins. With different types of wine varieties as its flavors, for all those wine lovers. Healthier versions of alcohol are rapidly becoming popular and new products are emerging for such consumers that would rather consume more of the healthier version than other alternatives”.

#3

“For the most part, I only like to drink normal water. I am not into beverages or sodas or anything of the sort. When I do drink anything else, it is always for the health benefits. For example, I have been drinking an emergence every morning given the current situation with COVID-19. I think this drink has really appealing health benefits which would absolutely encourage me to try it. The survey was great at presenting the health benefits, and nutritional values which is important to me”.

#4

“My biggest criteria for choosing a beverage comes down almost entirely to taste. I’ll often try any beverage I can for the first time, and if I don’t like it is unlikely, I will opt to have it again. I usually stay away from extremely sugary drinks even if they taste good, due to the health factors. Personally, I am not a huge alcohol person, so it is unlikely that the beverage presented in the survey would taste great to me. However I did like the design and overall aesthetic of the can and if I were to try it and like it, it is likely I would buy a case. But since for me the biggest criteria is taste, it is hard to critique something through an online survey”.

#5

“For me, choosing a beverage is not a very complicated process. I am most often motivated by thirst accompanied by a desire for a particular flavor. If I want a fruitier tasting drink, I might go for a juice or tea. If I want something caffeinated, I might go for a cola. Second to flavor, my next consideration is nutrition/calorie count. I know a sugary beverage like a soda is not as good for me as water, I will make sure to drink more water throughout the day than I do cola. Even though I like bubbly sodas, I am not as much a fan of sparkling water, even if it flavored, so I am not sure if I would like to drink the beverage described in the survey. However, I think the survey is a thorough one; all of my criteria were present in the survey”.

#6

“My criteria for choosing drinks is usually based off of taste and nutrition. The most important part of the drink for me is whether or not it tasted good because I won't drink it if it tasted bad. I also like to drink beverages that are somewhat good for me and make me feel better after drinking it. In terms of nutrition, the beverage nutrition facts label said the beverage was actually quite healthy which is a positive criterion for me. I also like the idea of having real wine grape juice in the drink. I think I would very much enjoy that taste in a beverage”.

#7

“My criteria for choosing a beverage are nutrition, cost, and taste. When buying a beverage, I consider whether it is really something that I need to be drinking. Even if I like how it tastes and it is a good price, I'll often skip buying a beverage without much nutritional value unless it is for a treat or special occasion. Cost is important to me because I figure that if I'm going to spend money on a beverage, it should be worth it. Taste is important because if I don't like how something tastes there's a strong chance, I won't buy it. The strongest criteria that were present in the beverage in the study were that it was the flavor and the cost. The wine flavor is unique compared to other sparkling water flavors available. The price was also less than I thought it would be”.

#8

“My main criteria for choosing a beverage includes taste, healthiness, and price, respectively. When I choose a beverage, I often go for the drink that has the taste that I am craving regardless of how healthy or expensive it is. If the only options available are about equal in taste or aren't tasty for me at all, I will choose the drink that is the healthiest option. If there are multiple healthy options that are about equal in taste, I will choose based on the cheapest available. In the survey of the H2O soft seltzer beverage, I was very impressed and attracted to the potential taste of the beverage and the price per can. It seemed that the taste was there as there were attractive grape flavors, and the price was much cheaper than I thought it would be considering all of the vitamins, nutrients, and positive health factors being put into the beverage. Due to all of my choosing criteria being present, I would definitely be interested in this beverage”.

#9

“I look for beverages that have no added sugar and that are gluten-free because I have an allergy. I also look for fun new flavors and types of drinks (like kombucha and various juices). I am very

drawn to the concept for this drink and I would see myself purchasing it due to curiosity alone. I also am studying to be a packaging designer so the graphics on the can are also something that tends to sway my buying choices quite a lot. I think the survey covered a lot of my questions as far as the beverage is concerned. the health benefits and nutritional facts are always something I look at if I am going to be purchasing a large quantity of something. I think the term "soft seltzer" is tricky to understand and I wish that lack of alcohol content was more prevalent in the design on the packaging. I think that a simpler design would be more effective”.

#10

“When choosing a beverage, it really depends on the occasion. If I am hanging out with friends in the summer, and won't be driving, I'll probably drink a hard seltzer or hard kombucha. Otherwise, I generally stick to water quite honestly. I'm not really into drinking non-water beverages when it isn't some sort of occasion. Sometimes, I will grab a sparkling water if we have them at home and I feel like sipping on something my 'exciting' but don't want any alcohol. I feel like this could be when I would drink the H2O from the survey. There are times that I want a fun drink but don't want any alcohol, whether I'm by myself or with people and planning on driving. In these situations, if I liked the H2O I could see myself grabbing one”.

#11

“When I'm looking for a beverage I often think about calorie and sugar content. Not that I'm trying to avoid it completely but want to be sure that I am consuming a healthy amount. I'm not one to really drink sodas, coffee, or alcoholic drinks so I don't necessarily actively think about it when having a meal. Both of my criteria were actually included in the survey which makes me think that whoever came up with this product really wanted to cater toward potential buyers. I thought it was also interesting that would include other beverage information like 'No GMO, electrolytes, B vitamins' because that's not normally marketed”.

#12

“When choosing a beverage I typically pay attention to a couple things. The most important factor is the taste, if a drink tastes good, I'm way more likely to purchase it. The second most important factor is price, I'm a relatively cheap person so if a beverage is expensive, I'm not very likely to buy it. A final factor is the nutritional benefits, this is a relatively weak factor for me because at the moment I can eat a lot and not gain weight.”

#13

“The main criteria in choosing a beverage, in my opinion, is taste, ingredients, and nutrition information. I tend to not pick drinks that are overly sweet or sugary like sodas. They do not really appeal to me and I generally avoid them. I feel like nutrition information and ingredient list go hand in hand. I try to avoid drinks with a high sugar and calorie content but knowing the ingredients can alter my perception of the nutrition facts. For example, if the nutrition label reports high sugar content, but the drink is only made from fruit juice, I would be more likely to pick it over a drink with a high sugar content that was made with artificial sweeteners or straight sugar. Although the survey did not outright list the ingredients, certain key words like no artificial sweeteners stuck out. There was not much mention of what the drink tasted like besides the various flavors of wine, which I was unfamiliar with”.

#14

“My personal criteria for buying a beverage is the taste and nutritional benefits. I need to like the taste of something in order to drink it and spend my money on it. I also make sure to look if there is added sugar because I try to limit my added sugars in my diet. Also, when looking at the label I look for ingredients that I know. If there are artificial sweeteners or ingredients that I can't pronounce, I won't buy it. I like to know what I am putting in my body and these ingredients can make my stomach hurt. For me, drinking normal water can get boring, but I want to make sure to stay hydrated throughout the day. These sparkling drinks can really help me get my water intake up. In the survey, I think the nutritional benefits stood out the most for my criteria. It mentions the vitamins and electrolytes contained in it which really appealed to me. Especially since the beverage mentioned Vitamin B-12 in it since I know this vitamin is lacking in my diet. I felt like the taste aspect was absent in the survey. It didn't mention much about the taste besides the wine grapes, but it didn't go into much detail. Taste is a big part of the beverage industry”.

#15

“When I am choosing a beverage, I usually rely on friends to give me good suggestions, in the beginning, to start my decision making. After that, I tend to look at the number of calories, carbohydrates, sugars, and proteins that I can get from each beverage I would be drinking. Another criterion I would look at would probably be the flavor of it because there are some flavors, I have learned I do not like over the years. I think one of the strongest criteria that was present which semi-deterred me from wanting to try it was the number of carbohydrates and sugars that were in the one can of the drink. I do really like the idea of it however as it is a good way for people to get the taste, they love without the alcohol content which opens up a whole realm of possible buyers”.

#16

“I tend to choose my beverages mainly based on taste, but I also try to avoid drinks that are too acidic because of how they affect my teeth. In high school, the places I worked all offered free soda, which I would drink too much of, and it impacted my dental health. Now that I am in college, I drink lots of milk, which has been helpful for my teeth. While it may not be accurate, my assumption would be that a sparkling wine-based seltzer is as acidic or more as soda, so I would not necessarily be likely to purchase it”.

#17

“When I choose a beverage, I look for one with not too many calories and no artificial flavoring. Also I prefer beverages with not a lot of added sugar. I usually buy beverages that I am familiar with and that I know taste well. If I am intrigued by a beverage, I will sometimes buy it out of curiosity. This beverage met my criteria for choosing a beverage. It has a lot of health benefits so I would definitely purchase it. Also it is intriguing, and I have never heard of anything like it. I would buy it solely to try it and if I liked the taste, I would continue to purchase it”.

#18

“My criteria for choosing a beverage are used based on its taste, and the health factors. Since I usually only drink water when it comes to picking a different beverage the taste is what matters most to me and not the expense or the health benefits as much. But if it is a workout drink, I

would choose the health benefits over the taste. So usually I would pick based on taste but in certain situations I would change my criteria slightly. The strongest criteria still though for me would be the taste as if I don't like the drink, I have no reason to drink it unless, it was for health reasons”.

#20

“My criteria for choosing a beverage is almost exclusively taste, but I will consider alcohol content as well as nutritional information when comparing similar beverages. I typically disregard the nutritional content of drinks because I usually just drink water and rarely drink sugary drinks. I felt like the aspect of taste wasn't really investigated too much in the survey despite how important a factor I think it is. There were only a couple questions that hinted at taste such as the ordering of wine types, but overall, the survey seemed to focus more on alcohol and nutritional content. While I think both of those characteristics are important to investigate, I don't know many people who would drink a product that they don't think tastes good regardless of other factors”.

#21

“It is all based on taste. I really do not care about calories, or anything else. Even if I need to drink an energy drink, I choose based on which tastes the best. Granted a good package may get my attention, but if it tastes bad, I will not bother to finish the six-pack. Taste was subtly there. White Claw was revered to (which I'm told tastes bad) and the product reminds me of lacroix; which I do not like. Based on those two pieces of information I already do not have any interest in this product. I should also point out that I do not drink very often and only like 2 or 3 wines, so I am probably not the target market”.

#22

“Criteria I look for when choosing a beverage typically include the packaging and sustainability qualities, as well as whether or not the product is organic. Additionally, I typically do not choose to purchase beverages with a great deal of added sugars, or from companies whose values seemingly do not align with my own. One aspect that was very strong for me, is the fact that the beverage does not contain alcohol, yet there is a bit of California-grown-grape flavor infused. I also found myself very attracted to the packaging of the product. I found it interesting that the nutritional description boasted the prominence of calcium. This would not be something that would sway my buying decision”.

#23

“My criteria to purchasing a beverage mostly depends on the sugar, price and packaging. I try to avoid a lot of sugar, mostly added and artificial sugars, as it is fattening and unhealthy. Price matters as a working and in debt college student. When I choose new drinks, I tend to look at packaging first to determine which interests me the most. I also don't drink much, therefore a soft seltzer would be appealing to me. I would say the strongest criteria is the nutritional component, particularly the sugars. 12g of natural sugars is pretty good and no artificial/added sugars. I did comment that I think the packaging is a little too busy. It is a bit overcrowded and busy, and they need to advertise non-alcoholic larger, as it is a key point to the “soft seltzer” notion”.

#24

“When choosing a beverage one of the first thing I look at is the variety of flavors and see if there is an interesting flavor that I may enjoy. Then I would look at the number of calories and also see the amount of sugar it contains. I tend to choose lower calorie beverages that are not loaded with added sugars. I also like when beverages contain electrolytes or additional vitamins. The beverage in the survey did a good job addressing the calories and the nutritional information, demonstrating that it is low in calories with no added sugars. That made it appealing. It also included interesting flavors”.

#25

“When I choose a beverage, I would say it is 70% taste and 30% health. As a freshman at Cal Poly, I would often drink a lot of soda. This was simply because of the good taste while I put aside the health factors. Later on, I started focusing on healthier options where I would take the time to look at the sugar and ingredients in the drinks. At this point I drank Yerba tea, Body Armour, and Vitamin Water. These were both tasty and also tasted good at the same time. While I would still say that soda tasted better than these options, I would choose the healthier drinks because I was living an active lifestyle and wanted to fill my body with healthy options. With the H2O beverage I would say that the healthy and tasteful combination is really appealing to me. I am interested in trying it out”.

#26

“When choosing a beverage, the first criteria that I look for is if the said product is non-alcoholic since I am not yet of drinking age. The next thing that I examine are the flavors to see if I know them and if all the flavors are new to me then I try to pick the one that has a more descriptive name. I also observe the font and color scheme that is being used on the package. If the font is too small or seems to be unclear at the first glance, then I usually decide to not buy it and the color schemes that attract me are bright colors that are either analogous or split complementary to each other. 2. The strongest criteria for me when buying a beverage is seeing if it is non-alcoholic and it was very present within the survey.

#27

“When choosing a beverage there are a few factors that I take into consideration. The main thing is whether or not it has caffeine. I am a big coffee drinker, so I find caffeine substitutes to be a big plus. However, I don't like them to be jam packed with sugar. I tend to break out really badly if it is too much; I am a huge fan of caffeinated sparkling waters. The caffeine. I think the drink has potential, in that it could be consumed when you want the taste of wine, but not the alcohol. It could, though, have caffeinated options”.

#28

“I mainly choose beverages based on how I think they taste and if they are not too unhealthy for me. I like to make sure they are not too many calories and don't have a lot of added sugar. I think the strongest criteria for me is taste as I will occasionally drink unhealthy beverages if they taste good. This beverage seemed like it would taste good based on the survey and I would definitely try it. If I liked it, I think I would buy it. It also seemed pretty healthy given the nutrition facts.

One thing I look for in sparkling/seltzer water is strong flavor because I am not the biggest fan of plain sparkling water, but if I like the flavor, I usually enjoy the beverage. I would be interested in trying the different flavors of this beverage shown in the survey”.

#29

“My criteria for choosing a beverage are generally how interesting it sounds, whether or not it has alcohol, and if it isn’t very calorie dense. I also don’t like the flavor of artificial sweeteners so making sure it doesn’t have those is important. The health benefits of certain drinks are also appealing to me, such as Kombucha. As for the strongest of my criteria, it’s usually the taste. Therefore, I don’t know how much I would like the drink described in the survey because I don’t love sparkling water. So assuming their beverage tastes how I predict from the description, the criteria were present”.

#30

“My criteria for choosing a beverage is usually based on the taste and sugars contained in the drink. I need to like the flavor/taste of the beverage in order to spend money on it. I find that the packing of a drink is often meant to represent the flavor of the beverage, so that affects my decision as well. I found that the drinks shown in the survey did have different packing that corresponded to the flavor of the drink which I liked. I also look at the amount of sugar in a drink, and if any artificial sweeteners are used because this affects my like or dislike for a drink as well”.

#31

“My criteria for choosing a beverage would be taste and nutritional value. When choosing a beverage I would choose something that I enjoy drinking. The flavor is first and foremost important. I would also look at the nutritional value. I am very mindful of what I put into my body. The amount of sugar added, and sweetener type is important to me. I do not like drinks with high fructose corn syrup or artificial sugars like sucralose or splenda even if "sugar free" drinks have less calories. I also tend to choose drinks that do not have artificial flavoring and other chemicals. I try to pick drinks with ingredients I recognize and can pronounce. I do not think the survey showed a list of ingredients”.

#32

“Some days if I'm craving sugar, I'll drink something sweet and on other days, I may want to drink something relatively healthier. I select my drinks based on flavor, nutrients, and calories. If I'm trying a new drink, the first thing that will catch my eye is the packaging and the details on the label. I consider trying drinks with low calories, infused vitamins and minerals, and no artificial flavors. I liked that the packaging had a lot of good information, but it seems a little cramped. I think having some white space is also important to grab the customer's attention. The most interesting criterion is that the drink is a "soft seltzer." H2O is a wine flavored sparkling water drink but with no alcohol and that makes it appealing. Maybe explicitly stating about this feature in a creative way. I also liked the fact that the drink has no added sugar”.

#33

“My criteria for choosing a beverage is typically what just sounds good at the time. I drink a lot of kombucha and sparkling waters because I crave carbonation and sometimes plain flat water is

boring. I don't drink caffeine so in the mornings I don't drink coffee. I typically drink some type of bubbly beverage and that somehow wakes me up a little bit. Call me weird but I like spending money on yummy beverages over yummy foods”.