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## Health Literacy Program to Reduce the Consumption of Sugary Drinks by Middle School Students in Jakarta

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### Abstract

There is a visible upward trend in the consumption of sugar-sweetened beverages across the world, and Indonesia is no exception. This study examined the effectiveness of school-based programs to increase the knowledge of junior high school students about sugar-sweetened beverages to decrease their consumption. A one-week intervention using a quasi-experimental design was conducted through the adoption of the Kids SIP<sup>smart</sup>ER (Lane, et al., 2017) program. The students who received the intervention showed significantly higher nutritional knowledge of drinks with high sugar content upon completion of the program. The intervention was also successful in inducing the desired attitudes, subjective norms, and perceived behavioral control in students. The participants also evinced intentions of reducing their intake of sugar-sweetened beverages. Additionally, one week after the intervention, participating students reported that they had reduced their consumption of sugary drinks.

### Literasi Kesehatan untuk Mengurangi Konsumsi Minuman Berpemanis pada Siswa SMP di Jakarta

#### Abstrak

Tren konsumsi minuman berpemanis menunjukkan adanya peningkatan konsumsi di berbagai penjuru dunia, termasuk Indonesia. Studi ini menguji efektivitas program intervensi yang dilakukan di sekolah, yang bertujuan meningkatkan pengetahuan siswa mengenai minuman berpemanis untuk menurunkan konsumsi minuman berpemanis mereka. Mengadopsi program Kids SIP<sup>smart</sup>ER (Lane et al., 2017), intervensi ini dilakukan sepanjang satu pekan dengan desain penelitian kuasi-eksperimental. Siswa yang menerima intervensi menunjukkan tingkat pengetahuan mengenai nutrisi minuman berpemanis yang lebih tinggi dibandingkan mereka yang tidak mendapatkan intervensi. Program intervensi juga berhasil menghasilkan sikap, norma subjektif, dan *perceived behavioral control* yang mendukung penurunan konsumsi minuman berpemanis. Selain itu, siswa yang menerima intervensi juga melaporkan penurunan yang signifikan pada jumlah dan frekuensi konsumsi minuman berpemanis.

*Keywords: adolescent, health literacy, nutritional knowledge, sugar-sweetened beverage, Theory of Planned Behavior*

#### Citation:

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### 1. Introduction

Time constraints and convenience propel choices of food and drink items and the consumption rates of prepackaged foods and beverages have increased over the years (Alamsyah, Sumarwan, Hartoyo, & Yusuf, 2010; Bleich, Wang, Wang, & Gortmaker, 2009). Sugary drinks have become a very popular category of packaged food and beverages in the market (Hebden, Hector, Hardy, & King, 2013; Sari, 2017). Drinking products with high amounts of sugar now form part of

the daily dietary intake of individuals across discrete age groups, including the youth (French et al., 2013; Han & Powell, 2013; Kubik et al., 2015; Muthmainnah, 2012; Powell, Harris, & Fox, 2013; Richard, 2011). Adolescents are targeted as substantial potential market for the beverage industry (Forde, Adams, White, Levy, & Greaves, 2018; Richard, 2011).

Sugar-sweetened beverages refer to drinks that contain as additives such as brown sugar, corn sugar, honey, lactose, syrup, maltose, syrup sugar, sucrose, among

other agents that can increase the pleasant sensory effects of sweet tasting food (Dietary Guidelines of Americans, 2015; Elfhag, Tynelius, & Rasmussen, 2007; Johnson et al., 2009; Woodward-Lopez, Kao, & Ritchie, 2010). While sweetness is pleasant to taste buds and therefore enhances the whole experience of drinking a beverage, it adds little to no nutritional content. Sugar-sweetened beverages include fruit or fruit-flavored drinks, sports drinks, non-sugar-free soda, energy drinks, sweetened waters, and coffee, milk, or tea packaged with added sugar (Dietary Guidelines of Americans, 2015; Han & Powell, 2013).

Excessive consumption of sugar-sweetened beverages is associated with health related problems including weight gain and various non-communicable disease such as type-2 diabetes mellitus, asthma and other respiratory disorders, high blood pressure, heart disease, liver disease, and other metabolic dysfunctions (Hu & Malik, 2010; Hu, 2013; Huang, Huang, Tian, Yang, & Gu, 2014; Kim & Je, 2016; Malik, Akram, Shetty, Malik, & Yanchou Njike, 2014; Woodward-Lopez, Kao, & Ritchie, 2011). In addition, weight gain is linked to psychological problems such as low self-esteem, depression, and self-isolation (World Health Organization [WHO], 2018). Numerous efforts have been launched to limit the consumption of these drinks in response to the public health problem. Such endeavors range from the implementation of macro-level health policies (e.g., imposing higher sales tax on sugary drinks, limiting access to sugary drinks on vending machines, facilitating free drinking water or low fat milk) (Colchero, Popkin, Rivera, & Ng, 2016; Chriqui, Turner, Taber, & Chaloupka, 2013; Han-Markey et al., 2012; Hawkes, 2010; Patel & Brindis, 2016; Purtle, Langellier, & Lê-Scherban, 2018) to educational programs that deliver lessons about sugar-sweetened beverages, the benefits of the water or low fat milk, water campaign, SNAP (Scouting Nutrition & Activity Program), counseling, etc. (Ha, Caine-Bish, Holloman, & Lowry-Gordon, 2009; Muckelbauer et al., 2009; Rauba et al., 2017; Rosenkranz, Behrens, & Dzewaltowski, 2010; Shicieri, et al., 2008; van de Gaar et al., 2014; van Grieken et al., 2013). To the knowledge of the authors of the present study, no nationally representative data is available on the consumption of sugary prepackaged beverages in Indonesia. However, several studies indicate the excessive consumption of sugar-sweetened drink by young people. Skriptiana (2009) found that 32.4% of 108 students aged 12 to 14 years sampled in a junior high school in Depok consumed 1 to 2 medium-sized bottles or cans of soft drinks per week on average. Similarly, another study conducted on a group of students in Depok reported that as many as 46.9% of the sample consumed soft drinks at an average frequency of 1 to 3 medium size bottles or cans a week (Muthmainnah, 2012). These results prove that young people, who are characterized by high levels of curiosity and adventurousness tend to be

more likely to consume sugar-sweetened beverages (Ali & Asrori, 2011). Most of the adolescents respond that they tend to consume sugar-sweetened beverages because of their good and refreshing taste (Batram, Piché, Beynon, Kurtz, & He, 2016; Dewi, 2017; Skriptiana, 2009).

Research suggests that school-based intervention programs have the potential to reduce the intake of sugar-sweetened beverages among adolescents (Avery, Bostock, & McCullough, 2015; Abdel Rahman, Jomaa, Kahale, Adair, & Pine, 2018; Vargas-Garcia et al., 2017; Vézina-Im et al., 2017). For example, some researchers developed an educational curriculum (e.g., contents of sugary drinks, benefits of water consumption for the body, encouragement to consume low fat dairy drinks), displaying a banner and gifting children and school teachers water bottles with the campaign logo to promote the consumption of water. Other, similar interventions have also been conducted. These programs include the “Join the Healthy Boat” plan for the promotion of a healthy lifestyle that incorporates the reduction of sugar-sweetened beverage consumption, especially soft drinks), the ‘HEALTHY’ agenda to increase multiple components of a healthy lifestyle (encompassing increased water consumption), and the ‘Kids SIPsmartER’ model (Kobel et al., 2014; Lane et al., 2017; Muckelbauer et al., 2009; Rauba et al., 2017; Sichieri, Trotte, Adriana de Souza, & Veiga, 2008; Siega-Riz et al., 2011).

However, Kids SIPsmartER is the only program that focuses solely on sugar-sweetened beverages and that uses in-class activities. More specifically, unlike other programs Kids SIPsmartER does not include instruments other than in-class lessons (such as the provision of water bottles or fountains). Instead, Kids SIPsmartER delivers six lessons to the participants (sixth and seventh graders) in a more efficient and cost-effective manner. In addition, the intervention also augments health literacy by facilitating students to independently acquire knowledge, to process such knowledge, to understand, to evaluate, and to act on the information they receive about sugar-sweetened beverages. Ultimately, the program intends to elicit a voluntary change that benefits both individual and community health (Freedman et al., 2009; Lane et al., 2017).

Employing the framework of the Theory of Planned Behavior (TPB) (Ajzen, 2015), health literacy, and media literacy, the Kids SIPsmartER program consists of six 45-minute classroom sessions conducted over six weeks. The students’ responses are measured at the end of the first, third, and fifth weeks. Lane et al. applied TPB (2017) to measure the daily beverage consumption of students, their attitudes toward sugary drinks, their subjective norms (i.e. the perception of what peers and parents thought about sugary drink), and their perceived

behavioral control vis-à-vis the reduction of sugary drink consumption. These researchers reported in comparison to the control group, students in the treatment group were able to significantly reduce their sugary drink consumption upon the completion of the program (Lane et al., 2017).

The present study adopted the Kids SIP<sub>smart</sub>ER and designed an intervention to limit the sugary drink consumption of junior high school students in Indonesia. Several strategies have been implemented in discrete countries to reduce the consumption of sugar-sweetened beverages (Avery et al., 2015; Han-Markey et al., 2012; Vezina- Im et al., 2017), but such studies have never before been attempted in Indonesia. The current research project aimed to examine the effectiveness of health literacy combined with the *Theory of Planned Behavior* construct by modifying the Kids SIP<sub>smart</sub>ER conducted by Lane and associates (2017) into denser curriculum delivered in a shorter time frame. The intervention was applied to students who lived in Jakarta, the capital of Indonesia. The present study also modified a drink size calculation using milliliters and added a role play to the last lesson on the second meeting to make the delivered content more attractive for participants and easier for them to grasp so that the youngsters could become healthy agents in both the home and school environments.

Drawing from previous studies, this study tested the following hypotheses:

H1: The health literacy program would reduce the participants' consumption of sugar-sweetened beverages.

H2: The health literacy program would increase the participants' nutritional knowledge about sugar-sweetened beverages.

H3: The health literacy program would increase the participants' favorable attitudes toward the reduction of sugar- sweetened beverage consumption.

H4: The health literacy program would increase the participants' subjective norms toward the reduction of sugar- sweetened beverage consumption.

H5: The health literacy program would increase the participants' perceived behavioral control toward the reduction of sugar-sweetened beverage consumption.

H6: The health literacy program would increase the participants' intentions of reducing the consumption of sugar- sweetened beverages.

## 2. Methods

**Ethical Clearance.** The protocols for both the preliminary study and the intervention program were approved by the Research Ethics Committee of the Faculty of Psychology, University of Indonesia, in April 2019

**Participants.** The preliminary study and the intervention program were both conducted at a public junior high school located in North Jakarta, Indonesia. The school is an A-accredited institution with students belonging to middle- to upper- economic family backgrounds. Students from six classes, three 7<sup>th</sup> grade sections and three 8<sup>th</sup> grade sections, participated in the preliminary and intervention studies. The number of participants totaled 121 students, 66 of them girls ( $M_{Age} = 13,18$ ,  $SD = 0,72$ ). The school was selected as a site for this research due to the researchers' personal access to the school's principal via their social network. Forms seeking active parental consent were distributed prior to the conduction of the preliminary study and the intervention. In addition, the researchers also obtained informed consent from the students. Only students who brought signed parental consent forms and who themselves signed their informed consent participated in the study. Of 135 students, 14 did not bring parental consent and/or did not themselves consent to take part in the study. Hence the number of participants was ultimately reduced to 121.

**Preliminary Study.** The preliminary study was conducted in the second week of February 2019 to measure the students' sugary drink consumption and to develop and tailor the intervention program. The protocol for this preliminary survey was approved by the Ethics Committee of the Faculty of Psychology, University of Indonesia, on February 5, 2019. The survey obtained responses from 121 students, and its results suggested that a high 68% of the participating students consumed a minimum of 1 medium-sized bottle or can of a sugar-sweetened beverage every day. 54.5% of students reported consuming sugary beverages during recess in school and 41.3% purchased the drinks at their school cafeteria. Additionally, 77% of participants lacked adequate nutritional knowledge of sugar-sweetened beverages. This result illustrated the need for an intervention program to educate students about sugary drinks to enable them to limit their intake of sweetened and prepackaged beverages.

**Intervention Program.** The pre-test and intervention program were conducted in the second and fourth week of April 2019. This intervention program used a quasi-experimental approach because the students remained in their classrooms when the study was conducted. The school permitted the researchers to run the intervention program during the periods scheduled for sports, Indonesian language (Bahasa Indonesia), social studies, English language, counseling, and civics classes. Since it was not possible to randomize students into experimental and control groups, three sections served as the treatment group while the remaining three sections were designated the control group. The assignment the two groups was randomized through a draw. Participants in the treatment group received

**Table 1. Health Literacy Curriculum for SMP N “X” at Jakarta**

Day and Topic	Key Learning Objectives	Key Theoretical Constructs (Theory)
<b>1. Pre-Test</b> <b>What’s in Your Drink?</b> <b>Cue: #Stop</b>	Pre-test <ul style="list-style-type: none"> <li>Identify the meaning of sugar-sweetened beverages</li> <li>Identify the difference between a sugar-sweetened beverage and a non-sugar-sweetened beverage</li> <li>Identify the ingredients found in a sugar-sweetened beverage (especially ready-to-drink sugar-sweetened beverages in a liquid consistency)</li> <li>Identify any health related risks from the excessive consumption of sugar-sweetened beverages</li> </ul>	Attitudes (TPB); Conceptual Foundation (PHL)
<b>Drop the Sweet One!</b> <b>Cue: #Read</b>	<ul style="list-style-type: none"> <li>Calculate the milliliters, number of calories, and sugar in a sugar-sweetened beverage</li> <li>Recognize whether the participant’s consumption of sugar-sweetened beverages is excessive</li> </ul>	Attitudes (TPB); Conceptual Foundation (PHL)
<b>2. Drop the Sweet One! (sequel)</b> <b>Cue: #Read</b>	<ul style="list-style-type: none"> <li>Review previous meeting material</li> <li>State the reasons and goals to be achieved individually and in groups in an effort to reduce sugar-sweetened beverages consumption.</li> <li>Mention personal barriers that may make it difficult for a participant to reduce sugar-sweetened beverage and identify ways to overcome them</li> </ul>	Attitudes (TPB); Subjective Norms (TPB); Intention (TPB); Conceptual Foundation (PHL)
<b>Action Time: Role Play</b> <b>Cue: #Change</b>	<ul style="list-style-type: none"> <li>Participant role-plays on “being a healthy role model”</li> <li>Facilitator feedback on persuasion techniques used in role playing</li> </ul>	Perceived Behavioral Control (TPB); Intention (TPB); Critical Skills (PHL); Civic Orientation (PHL)
<b>3. Post-Test</b>	Post-test	

**Table 2. Lesson Plan of the Health Literacy Program for Students SMP N “X” at Jakarta**

	Schedule	Experimental Group	Control Group
<b>Second and Fourth week of April 2019</b>	Day 1	- What’s in Your Drink? - Drop the Sweet One!	What is communication?
	Day 2	- Drop the Sweet One! (sequel) - Action Time: Role Play	Say it verbally and non-verbally
<b>Measuring the Effectiveness of Health Literacy</b>			

the health literacy program, whereas the control group received literacy pertaining to effective communication. The health literacy program in this study focused on the reduction of the consumption of sugar-sweetened beverages such as regular soda (excluding sugar-free), fruit drinks, sport drinks, energy drinks, and ready-to-drink sweetened water in liquid from packed in bottles, cans, and cartons and was adapted from the Kids SIP<sup>smart</sup> ER model (Lane et al., 2017). The health literacy program curriculum is presented in Table 1.

The intervention was conducted by six facilitators who had graduated from University of Indonesia. Each

facilitator was assigned one of the six sections of the identified 7<sup>th</sup> and 8<sup>th</sup> grades in the junior high school as mentioned above. The facilitators were fully briefed before the intervention to ensure that they had attained an identical understanding of the program and the desired methodology of presenting the designed material to the students. In addition to the briefing, all facilitators were also equipped with a guide of the module to aid in the delivery of the material.

The intervention involved two 80-minute sessions executed over two days within the same week. The assessment of the nutritional knowledge, the determinants

of the Theory of Planned Behavior (attitudes, subjective norm, perceived behavioral control, intention), and the behavior of the participating students was performed three days after the second meeting. The intervention was short and condensed in accordance with the school's permission.

**Measurement and Analysis.** The knowledge, attitudes, subjective norms, perceived behavioral control, intentions, and behaviors of the participating students were assessed through 28 multiple choice questions administered before and after the intervention. All measurements were presented to the students in the form of a self-report questionnaire.

**Nutritional Knowledge.** The variable of nutritional knowledge about sugar-sweetened beverages has been found to be closely related to their consumption (Bleich, Herring, Flagg, & Gary-Webb, 2012; Gase, Robbles, Barragan, & Kuo, 2014; Park, Onufrak, Sherry, & Blanck, 2014; Su, 2012). A six-item measure was utilized to test the participating students' knowledge of sweetened drinks and sugar consumption. The items queried students about types of sugar-sweetened beverages, their ingredients, the recommended amounts of daily sugar consumption (in teaspoon size and grams), the conversion of one teaspoon of sugar to grams, and the impact of consuming excessive sugar-sweetened beverages. Every correct answer was scored "1" and incorrect answers were marked "0" ( $M_{pre} = 7.07$ ,  $SD_{pre} = 2.66$ , Cronbach's  $\alpha_{pre} = 0.38$ ;  $M_{post} = 9.07$ ,  $SD_{post} = 3.15$ , Cronbach's  $\alpha_{post} = 0.54$ ).

**Attitudes toward Sugary Drinks.** The attitudes of the participating students vis-à-vis the consumption of sugar-sweetened beverages were measured using a six-item index (e.g., "For me, not drinking more than 3 bottles / cans / cartons of tea, coffee, soda, milk or juice packs a week will be \_\_\_"). The responses for each item ranged between "fun - not fun; healthy - not healthy; unsatisfying - satisfying; wise - not wise; boring - interesting; dangerous - worthwhile" (Riebl et al., 2016). The items were scored on a 5-point Likert scale, where "1" corresponded to the most unfavorable response (e.g., "very unhealthy") and "5" represented the most favorable response (e.g., "very healthy"). The obtained responses were averaged to attain mean pre- and post- intervention scores of 3.38 and 3.58 ( $SD_{pre} = 0.75$ ,  $SD_{post} = 0.78$ ) respectively, with Cronbach's  $\alpha_{pre} = 0.73$ , and Cronbach's  $\alpha_{post} = 0.82$ .

**Subjective Norm.** The perceptions of participating students with regard to the opinions of their peers, teachers, and parents on sugary drinks students were assessed through nine questions (Bruening et al., 2014; Hackman & Knowlden, 2014; SanGiovanni, Fallar, Green, & Mogilner, 2017). Friends, teachers, and parents are regarded to be figures who influence the sugary drink consumption of teens (Battram et al., 2016; Hackman & Knowlden, 2014; SanGiovanni et al.,

2017). For example, the items read, "My parents want me to refrain from drinking more than 3 bottles / cans / cartons of tea, coffee, soda, milk, or juice packs in a week;" "My parents say that I should not drink more than 3 bottles / cans / cartons of tea, coffee, soda, milk, or juice packs in a week;" "How much pressure do you feel from the teachers, parents, and peers to avoid drinking more than 3 bottles / cans / cartons of prepackaged tea, coffee, soda, milk, or juice packs in a week?" (Kassem, Lee, Modeste, & Johnston, 2003; Riebl et al., 2016). Students responded on a 5-point Likert scale where "1" and "5" respectively indicated the most unfavorable and favorable responses (e.g., "1" = strongly disagree, "5" = strongly agree). The students' responses were then averaged to yield a mean of pre- and post- values of 3.08 and 3.19 ( $SD_{pre} = 0.56$ ,  $SD_{post} = 0.58$ ) with Cronbach's  $\alpha_{pre} = 0.72$  and Cronbach's  $\alpha_{post} = 0.74$ .

**Perceived Behavioral Control.** Perceived behavioral control was measured using a single item: "I can control myself and limit my consumption of tea, coffee, soda, milk, or juice packs to no more than 3 bottles / cans / cartons a week if I really want to." As with the above statements, students responded on a 5-point Likert scale ("1" = strongly disagree, "5" = strongly agree). This item was adapted from Riebl et al. (2016). The mean pre- and post- test scores for this item were 3.93 and 3.87 ( $SD_{pre} = 0.77$  and  $SD_{post} = 0.81$ ).

**Intention to Reduce Consumption of Sugary Drinks.** The intention of participating students to reduce their intake of sweetened beverages was studied from their responses to the following four items, "I tend to not drink more than 3 bottles / cans / cartons of tea, coffee, soda, milk, or juice packs in a week," "How unlikely am I to consume more than 3 bottles / cans / cartons of tea, coffee, soda, milk, or juice packs for a week?" "How much motivation do I have to limit my intake to no more than 3 bottles / cans / cartons of tea, coffee, soda, milk, or juice packs in a week?" and "If everything goes according to my plan, I will not drink more than 3 bottles / cans / cartons of tea, coffee, soda, milk, or juice packs in a week (Kassem et al., 2003; Riebl et al., 2016). Students responded by scoring each item on a 5-point Likert scale where "1" indicated an unfavorable response (e.g., "strongly disagree," "very unlikely") and "5" indicated favorable responses (e.g., "strongly agree," "very likely"). The responses were averaged ( $M_{pre} = 3.49$ ,  $SD_{pre} = 0.69$ , Cronbach's  $\alpha_{pre} = 0.76$ ;  $M_{post} = 3.68$ ,  $SD_{post} = 0.68$ ; Cronbach's  $\alpha_{post} = 0.80$ ).

**Sugary Drink Consumption.** The sugary drink intake of the participating students was measured by querying the frequency and amount (in milliliters) of prepackaged sweetened beverages they had consumed in the past week (Hedrick et al., 2012; Riebl et al., 2016; Skriptiana, 2009; Trinidad Global School-based Student Health Survey, 2017). The types of sugar-sweetened beverages

included in the study were packaged tea, coffee, soda, fruit juice, milk, flavored or sweetened drinks, and electrolyte or isotonic or liquid energy drinks that were ready for consumption in cans, bottles or cartons. Several bottles of different sugar-sweetened beverages were displayed to the class and a guidance sheet containing the types, brands, and sizes of sugar-sweetened beverages was distributed to the students while the questionnaire was administered to help students estimate the amount of sweetened liquid they had consumed. The answers tendered by students with regard to the frequency of their sugar-sweetened beverage consumption were then coded into values between 0 (not consumed anymore) and 10 (more than three times per day) and the obtained figures were averaged to determine their sugary drink consumption (ml) per day. (Frequency of sugary drink consumption:  $M_{pre} = 5.80$ ,  $SD_{pre} = 2.85$ ;  $M_{post} = 5.35$ ,  $SD_{post} = 2.93$ ; Intake:  $M_{pre} = 395.79$ ,  $SD_{pre} = 332.24$ ;  $M_{post} = 346.37$ ,  $SD_{post} = 304.16$ ).

### 3. Results

The scores collated from the questionnaire were analyzed using the Generalized Linear Model (GLM) ANOVA on IBM SPSS version 25. The variable of time (pre-test vs. post-test) was treated as a within-subject factor, whereas group (treatment vs. control) was treated as a between-subject factor. Seven outcome variables were analyzed separately: nutritional knowledge, attitudes, subjective norms, perceived behavioral control, intention, and sugar-sweetened beverages consumption.

A total of 206 students were eligible to participate in this study, but 11 students did not return their signed parental consent forms, 12 students were not present for the pre-test, and 17 students were not present for the post-test. Therefore, the final number of 166 participants were included in the analysis phase: 83 participants each in the treatment and control groups. Table 3 summarizes the students' responses to each measure.

#### Sugar-Sweetened Beverage Consumption by Students.

The GLM ANOVA test suggested significant interactions with time and group on students' reported frequency and their intake amount of sugary drinks ( $F_{frequency} (1.164) = 15.61$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.09$ ;  $F_{intake} (1.164) = 13.55$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.08$ ). In other words, students in the treatment and control groups differed in their change of sugary drink intake after the completion of the program. Further analysis showed that students who received the health literacy program reported a decrease in their sugary beverage consumption [ $t_{frequency} (82) = 4.24$ ,  $p < 0.001$ ;  $t_{intake} (82) = 4.94$ ,  $p < 0.001$ ] while those in the control group showed no significant change in consumption. Thus, H1 was confirmed. The patterns of the interactions are illustrated in Figures 1 and 2.

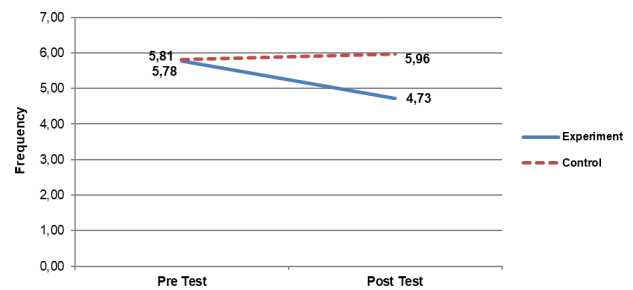


Figure 1. Frequency of Sugar-Sweetened Beverage Consumption

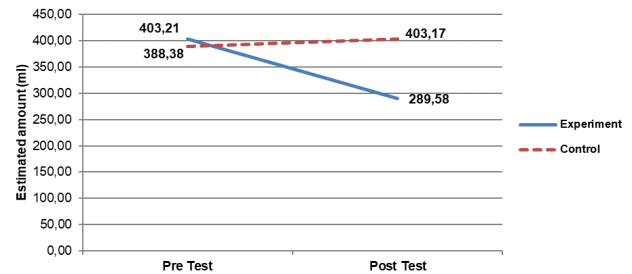


Figure 2. Amounts (ml) of Sugar-Sweetened Beverage Consumed

Table 3. Results of the Measurement of the Effectiveness of Health Literacy across all Variables and Groups in SMP N "X" at Jakarta in 2019

	Experiment Group		Control Group	
	Pre-Test Mean (SD)	Post-Test Mean (SD)	Pre-Test Mean (SD)	Post-Test Mean (SD)
Frequency of sugar-sweetened beverage consumption	5.78 (2.71) ***	4.73 (2.86)***	5.81 (3.00)	5.96 (2.91)
Estimated amount (milliliters) of sugar-sweetened beverage consumption	403.21 (321.37)***	289.58 (272.45)***	388.38 (344.56)	403.17 (324.64)
Nutritional knowledge	7.31 (2.83)***	10.90 (2.54)***	6.82 (2.46)	7.23 (2.59)
Attitude	3.26 (0.78)***	3.80 (0.74)***	3.50 (0.71)	3.36 (0.76)
Subjective norm	3.06 (0.52)**	3.25 (0.58)**	3.10 (0.61)	3.13 (0.58)
Perceived behavioral control	3.87 (0.75)	3.99 (0.86)	3.99 (0.79)*	3.75 (0.75)*
Intention	3.39 (0.66)***	3.89 (0.67)***	3.58 (0.70)	3.46 (0.63)

Note. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

**The Nutritional Knowledge of Students.** Data analysis also yielded a significant interaction between time and group on the nutritional knowledge of students [ $F(1.164) = 67.76, p < 0.001, \eta_p^2 = 0.29$ ]. The follow-up test conducted to probe the interaction indicated that the treatment group showed a significant increase in their knowledge about nutrition [ $t(82) = -12.09, p < 0.001$ ]; however such increase was not found among students in the control group [ $t(82) = -1.66, p = 0.10$ ] (Figure 3). Therefore, H2 was supported.

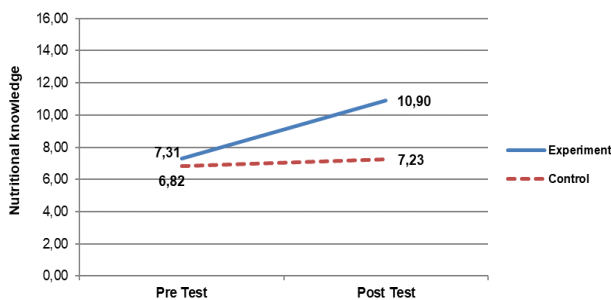


Figure 3. Nutritional Knowledge of Sugar-Sweetened Beverages

**The Attitudes of Students Toward the Consumption of Sugary Drinks.** The GLM ANOVA exhibited a significant difference in attitude change between students in the treatment and control groups [ $F(1.164) = 41,73, p < 0.001, \eta_p^2 = 0,20$ ]. Based on a paired-sample t-test, the attitude among treatment group participants showed a significant change toward the reduction of sugar-sweetened beverages [ $t(82) = -7.82, p < 0.001$ ], whereas no significant change was found among students in the control group, lending support for H3. This pattern is illustrated in Figure 4.

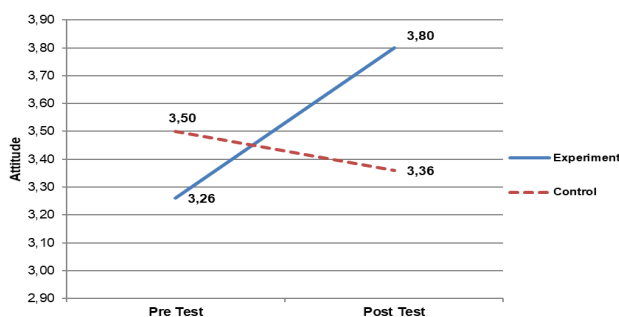


Figure 4. The Attitudes of Students toward the Reduction of their Consumption of Sugar-Sweetened Beverages

**Subjective Norms to Reduce Sugar-Sweetened Beverage Consumption.** The GLM ANOVA also indicated a significant difference between students in the treatment group and their control group counterparts in the change of the perception of subjective norms [ $F(1.164) = 4.35,$

$p = 0.04, \eta_p^2 = 0.03$ ]. More specifically, those who received the health literacy program reflected a stronger subjective norm after participating in the treatment group ( $t(82) = -3.33, p = 0.001$ ), whereas the control group evinced no significant change in terms of the subjective norm. H4 was thus confirmed. The interaction can be seen in the following graph (Figure 5).

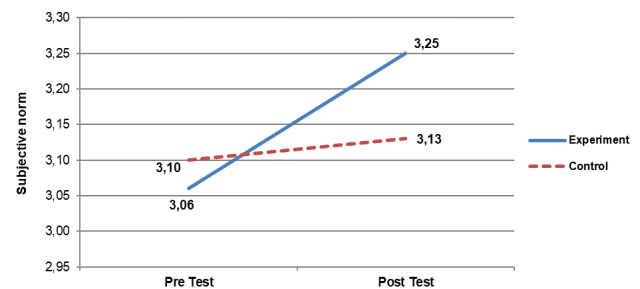


Figure 5. Subjective Norm to Reduce Consumption of Sugar-Sweetened Beverages

**Perceived Behavioral Control to Reduce Consumption of Sugar-Sweetened Beverages.** Upon the completion of the program, students in the treatment group reported significantly different perceived behavioral control than students in the control group [ $F(1.164) = 7.94, p < 0.01, \eta_p^2 = 0.05$ ]. Students who received the health literacy program showed stronger but not significant perceived behavioral control after participating in the intervention [ $t(82) = -1.37, p = 0.18$ ]. In contrast, those who did not receive health literacy program reported lesser perceived behavioral control [ $t(82) = 2.58, p < 0.05$ ] (Figure 6). In other words, the program was successful in making the participants feel that they were more able to limit their consumption of sugar-sweetened beverages, providing support for H5.

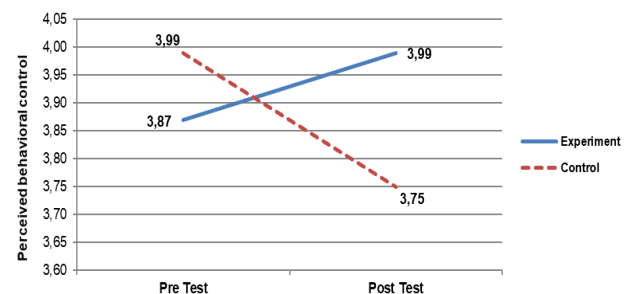


Figure 6. Perceived Behavioral Control to Reduce Sugar-Sweetened Beverage Consumption

**Intention to Reduce Consumption of Sugar-Sweetened Beverages.** The results also established interaction between time and group, indicating that students in the treatment group differed from those in the control group in their intentions to reduce their sugary drink intake [ $F(1.164) = 40.69, p < 0.001, \eta_p^2 = 0.20$ ]. Further assessment



found a significant increase in the treatment group students' intentions to reduce sugar-sweetened beverage consumption [ $t(82) = -7.95, p < 0.001$ ]; however, this increase was not found among students in the control group [ $t(82) = 1.61, p = 0.11$ ]. Therefore, H6 is supported.

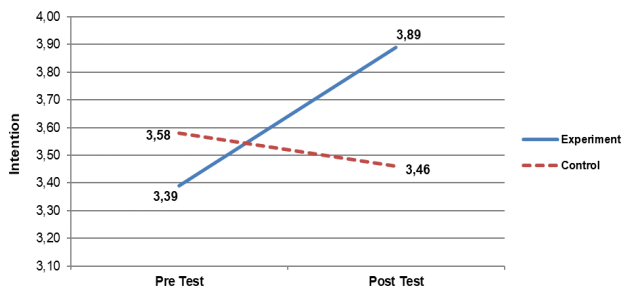


Figure 7. Intentions to Reduce Consumption of Sugar-Sweetened Beverages

#### 4. Discussion

This study is the first in Indonesia to examine the effectiveness of a health literacy intervention for adolescents focusing on sugar-sweetened beverages. The results of the analysis demonstrated that the frequency and quantity of sugary drink consumption decreased among participants in the group that received the health literacy module. This result is congruent with the findings of the study conducted by Lane et al. (2017) on the effectiveness of the Kids SIPsmartER program. This study also found that the health literacy program that was delivered was effective in increasing the overall knowledge of the participating students vis-à-vis sugary beverages, including as the definition of sugary drinks and the risks related to their consumption. The outcomes of the present study also corroborate the results of the investigation conducted by Freedman and associates (2009), which reported that health education can benefit participants by increasing their understanding of the impact of sweetened and prepackaged beverages for themselves as well as their environment. Knowledge is an important component of health literacy programs, as it promotes the actual health-promoting behavior of individuals (Su, 2012).

The program also changed the attitudes of students with regard to sugar-sweetened beverages and encouraged them to reduce their consumption. The intervention made a difference in their ideas on the subjective norm of sugary drink consumption, which is in line with the TPB framework used in this intervention (Bruening et al., 2014; Gratton, Povey, & Clark-Carter, 2007; Hackman & Knowlden, 2014). However, the present study's results on knowledge are contrary to the findings of Lane et al.'s study (2017), which reported that the intervention was not effective in transforming the attitudes of the participating students. Lane et al.'s

investigation found a "ceiling effect" in the pre-test that was conducted; the current study did not. When establishing the baseline of the present study, the researchers found that students did not generally evince very favorable attitudes toward consuming lesser quantities of sugary drinks; this initial unwillingness to reduce their intake may explain the differences between the findings of the present study and the outcomes of the one conducted by Lane et al. in 2007.

Overall, the change in results demonstrates the potential of the methodology of conducting school-based health education programs to mitigate the problem of excessive sugary drink consumption in adolescents. However, this study must acknowledge three limitations. First, intact class groups were used in this experiment instead of randomizing students into treatment and control groups. The absence of random assignment opens the possibility that the change evidenced in the knowledge, attitudes, and behaviors of the participating students resulted not only from the intervention but also from their interactions with their classmates. Second, the post-test was administered only three days after the last day of the intervention; therefore, the long-term effectiveness of the intervention was not tested. Third, the attitudes of students with respect to the consumption of sugary drinks and their beverage intakes were measured merely through self-reporting indices; hence, there exists the possibility that the students provided socially desirable responses that may not correspond to their actual behaviors. Further research is needed to assess the long-term effectiveness of health literacy interventions in decreasing the intake of sugary drinks by adolescents.

#### 5. Conclusion

This study confirms the effectiveness of health literacy education in increasing knowledge and in changing attitudes, subjective norms, as well as perceived behavioral control of participating students. The students in Jakarta aged between 12 and 15 years who were placed in the experimental group and who received the designed intervention appeared to have effected a reduction in their consumption of sugar-sweetened beverages. The results obtained by the current study are generally congruent with extant research on health literacy interventions focused on nutrition-related attitudes and behavior (Freedman et al., 2009; Lane et al., 2017) as well as with the TPB framework (Ajzen, 2015). The findings of this quasi-experimental study suggest that the adequate provision of appropriate and relevant nutritional knowledge about sugar-sweetened packaged drinks can help to transform attitudes, subjective norms, and perceived behavioral control of teenaged students. Such modules can thus be utilized as stepping stones through which students can be influenced to modify their intake of sweetened fluids.

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