

Validation of a Brief Questionnaire Against Direct Observation to Assess Adolescents' School Lunchtime Beverage Consumption

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ABSTRACT

Objective: Beverage consumption is an important determinant of youth health outcomes. Beverage interventions often occur in schools, yet no brief validated questionnaires exist to assess whether these efforts improve in-school beverage consumption. This study validated a brief questionnaire to assess beverage consumption during school lunch.

Methods: Researchers observed middle school students' (n = 25) beverage consumption during school lunchtime using a standardized tool. After lunch, students completed questionnaires regarding their lunchtime beverage consumption. Kappa statistics compared self-reported with observed beverage consumption across 15 beverage categories.

Results: Eight beverages showed at least fair agreement ($\kappa > 0.20$) for both type and amount consumed, with most showing substantial agreement ($\kappa > 0.60$). One beverage had high raw agreement but $\kappa < 0.20$. Six beverages had too few ratings to compute κ 's.

Conclusions and Implications: This brief questionnaire was useful for assessing school lunchtime consumption of many beverages and provides a low-cost tool for evaluating school-based beverage interventions.

Key Words: beverages, school, adolescent, drinking, diet, questionnaire validation (*J Nutr Educ Behav.* 2017; ■:1-5.)

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INTRODUCTION

Beverage consumption is an important determinant of youth health out-

comes such as obesity.¹ Because youth spend a large portion of their waking hours in schools, many healthy beverage interventions take place at

school.² To evaluate whether these strategies effectively change students' in-school beverage consumption habits, validated measures are needed. Although dietary recalls, plate waste measures, and direct observation are considered reference standards for assessing beverage consumption, these resource-intensive techniques are not feasible in many research or practice settings, and measurement tools are needed to assess beverage consumption in a rapid, low-cost manner.

Several brief questionnaires exist to assess beverage consumption, but each has limitations for assessing youths' in-school beverage consumption. The beverage intake questionnaire (BEVQ)-15 and -19 were developed for adult, not youth, populations.^{3,4} Paxton et al⁵ developed a school lunch recall for fourth-graders, but the tool does not assess beverages from non-cafeteria sources, which may comprise a large portion of beverages consumed at school.⁶ The Beverage and Snack Questionnaire⁷

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was developed for use with adolescents, but it does not capture intake of several beverage categories of interest to public health practitioners and policy makers, such as water.

To address these gaps in the literature, this study aimed to describe the development of a brief, self-administered questionnaire to assess adolescents' beverage consumption during school lunchtime and to examine the initial validation of the questionnaire against direct observations of students' beverage consumption.

METHODS

Participants and Recruitment

Data collection took place between December, 2012 and February, 2013. A convenience sample of 3 standard (ie, non-charter, non-magnet) public schools in the San Francisco Bay Area region of California was recruited. Eligible schools served students in grades 6–8. Because low-income and minority children tend to have less healthy beverage consumption habits than do higher-income and white children,⁸ eligible schools had at least 50% of students eligible for free or reduced-price meals through the *National School Lunch Program* and at least 50% of students of Latino or African American race/ethnicity. Schools were selected to represent a range of on-site beverage options, including milk and juice served as part of the *National School Lunch Program*, a variety of *à la carte* beverage choices, and different options for free water (traditional water fountain, water dispenser with cups, and water bottle-filling station). To recruit schools, research staff contacted school food service directors to assess interest and eligibility, mailed an informational letter to interested administrators, and made phone calls to explain study procedures and schedule a time for data collection.

At each study school, school staff recruited a convenience sample of 5–10 English-speaking students (total $n = 25$). Students' parents received an informational letter and provided written consent, and students gave written assent. All procedures were approved by the University of California, San Francisco Committee on Human Research.

Measures and Procedures

Based on a review of existing measures,^{4,5,7} the researchers developed a brief, self-administered questionnaire. The questionnaire was developed to evaluate a school-based cafeteria intervention⁹ and thus was focused on assessing students' beverage consumption during school lunchtime. This focus may also have increased accuracy, because youth can more accurately recall their consumption at a single meal compared with an entire 24-hour period.¹⁰ In addition, because youth report their dietary intake more accurately soon after consumption,¹¹ the questionnaire was designed for administration immediately after lunchtime.

To ensure face validity, several experts in dietary assessment as well as staff at California Food Policy Advocates, a public health organization with expertise in nutrition policy, provided input regarding the questionnaire (eg, whether appropriate beverages and portion sizes were used). Initial drafts were pretested with 3 middle school students and were revised based on their feedback, including adding instructions and reformatting so that each beverage appeared on a separate page. Next, a pilot of the validation procedures (see subsequent description) was conducted with 11 students at 2 eligible schools not included in the main validation study. Further revisions to the questionnaire were then made, including adding items asking for the name, flavor, and brand of each beverage item consumed.

The revised instrument was validated in a convenience sample of students ($n = 25$) from the 3 study schools. The instrument ([Supplementary Data](#)) included 14 closed-ended questions asking students to report whether they drank (yes/no) the following specific beverages during lunchtime: tap water from the cafeteria; tap water from outside the cafeteria; tap water from home; plain bottled water; flavored bottled water; plain milk; flavored milk; diet drinks; regular soda; regular sports drinks; 100% fruit juice; other sugary or sweetened drinks (eg, fruit-flavored drinks, sweetened coffee/tea); energy drinks; and any other beverages (write in the beverage type). For

each beverage consumed, students indicated the amount they consumed (a few sips, <1 glass or half a bottle, 1 glass or half a bottle, 2 glasses or 1 bottle, or >2 glasses or 1 bottle). Each item included images of the beverage type (eg, image of a milk carton) and of portion sizes (eg, image of a half-full glass).

Students also reported their demographic characteristics. Students completed questionnaires immediately after lunch in the cafeteria or another quiet location (eg, library). Questionnaires took approximately 5–10 minutes to complete. Students received a \$5 movie theater gift card for participating.

Trained research staff unobtrusively observed students' beverage consumption during lunchtime using a standardized tool ([Supplementary Data](#)). Research staff were paired to students 1:1; thus, the interrater reliability among observers was not assessed. Researchers recorded each beverage and the estimated number of ounces the student consumed (based on the observed starting and ending amounts in the container and/or the number of sips observed). For comparison with the questionnaire, the observer translated these estimates into questionnaire response options using the following conversions: <3 oz as response option 1 (a few sips); 3 to <8 oz as response option 2 (<1 glass or half a bottle), and 8 oz as response option 3 (1 glass or half a bottle). No students were observed to consume >8 oz of a given beverage (ie, no observations corresponded with the 2 highest response options).

Data Analysis

Research staff double-entered all data using the REDCap data entry system (Research Electronic Data Capture, Vanderbilt University, Nashville, TN).¹² For analyses, 3 new beverage categories were created: water from a free source at school (combination of all free water sources at school); all plain water (combination of water from a free source at school, tap water brought from home, and plain bottled water); and any sugar-sweetened beverage (combination of flavored water, soda, energy drinks, sports drinks, and other

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