**Research Brief**

**Manga Comic Influences Snack Selection in Black and Hispanic New York City Youth**

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**ABSTRACT**

**Objective:** To determine whether a single exposure to a Manga comic (Japanese comic art) with multiple messages promoting fruit intake influenced snack selection in minority urban youth.

**Methods:** Fifty-seven youth (mean age 10.8 y; 54% female; 74% black/African American) attending after-school programs in Brooklyn, NY participated in a pilot study in which they were randomly assigned to receive the comic or a non-health–related newsletter. After reading their media, participants were offered a snack and could choose from among healthy/unhealthy options. Secondary outcomes included knowledge, self-efficacy, and outcome expectations related to fruit intake and media transportation. Data were analyzed using regression and paired t test.

**Results:** Comic group participants were significantly more likely to choose a healthy snack, compared to the Attention-control group (odds ratio = 3.6, 95% confidence interval: 1.1–12.1, P = .04). The Comic group reported increases in self-efficacy (P = .04) and greater transportation (immersion into media) (P = .006).

**Conclusions and Implications:** Results suggest Manga comics may be a useful format to promote healthy snack selection in urban minority youth.

**Key Words:** childhood obesity, nutrition education, health promotion, snack selection, comic book (J Nutr Educ Behav. 2014;18(1):1-6.)

**INTRODUCTION**

Childhood obesity continues to be a serious public health issue in the US, and the rates are disproportionately higher among Hispanic and non-Hispanic black children.¹² This complex epidemic has been associated with increased consumption of energy-dense foods, including sugar-sweetened beverages,³ while 30% to 45% of US children between the ages of 6 and 18 years do not meet recommended fruit consumption levels.⁴ In addition, snacking accounts for up to 27% of children’s daily caloric intake, largely because of an increased proportion of snacking calories from candy, salty snacks, fruit juice, and fruit drinks over the past 3 decades, and decreased proportion of snacking calories from fresh fruit.⁵ Obesity prevention and weight management interventions targeting snacking behavior in youth may be more effective if high energy-dense foods are replaced with lower energy, nutrient-rich foods such as fruits and vegetables.⁶,⁷

Innovative interventions promoting positive dietary behaviors are needed to capture the attention of youth living in a multimedia environment. Narratives, such as entertainment-education and storytelling, may engage today’s youth population on health topics.⁸,⁹ Manga comics, which are Japanese comic art, are a unique form of multimodal narrative media combining visual images and text. Similar to Western-style comics, Manga comics combine artwork with storytelling. However, Manga are most distinguishable from Western comic books by their wide selection of genres, as well as their detailed artwork that may engage the imagination of readers.¹¹ They are a popular form of entertainment for youth in many countries including the US,¹² and therefore may be a novel platform to promote positive health behaviors in youth. Moreover, the graphics and minimal, concise language used in Manga comics could make them an appealing form of communication for younger populations,¹³ including late elementary school-aged children and adolescents.¹⁰,¹³,¹⁴

The Transportation-Imagery Model (TIM) explains how Manga comics may contribute to changes in health-related beliefs and behaviors. According to the TIM, persuasion of a story’s messages occurs because an individual is “transported” or immersed into the narrative world.¹⁵ The TIM also suggests that images are most impactful when they are embedded in a story, rather than provided in isolation.¹⁵

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Thus, visual images relevant to the story's messages, such as those incorporated in Manga comics, may further influence attitudes and beliefs.

Social cognitive theory (SCT) is a frequently used framework in effective dietary behavior change interventions and also lends explanation to ways in which Manga comics may influence health behavior in youth. Exposure to characters in the storylines may facilitate observational learning and influence health behaviors, particularly when readers relate to the characters in the comics and consider them role models. The development of entertainment-education narratives draws greatly on SCT by using role models to perform new behaviors.

Narrative approaches are emerging as promising tools for motivating and supporting health behavior change. A Manga comic with health messages guided by the TIM and SCT may be an effective vehicle to convey health messages and promote healthy behaviors. Thus, the purpose of this study was to determine whether exposure to a Manga comic with messages promoting fruit intake influenced snack selection in school-age, urban minority youth. The authors hypothesized that youth reading a Manga comic promoting fruit consumption would more likely choose fruit as a snack than youth in a control group.

METHODS

Participants

Participants were 57 youth attending 2 after-school programs affiliated with Brooklyn Community Services, a New York City (NYC)-based nonprofit community organization in the summer and fall of 2011; all were eligible to participate, as there were no specific exclusionary criteria. The average age of participants was approximately 11 years (range = 8.3–15.5 y). Nearly 90% of participants were either black/African American or Hispanic and 54% were female. About 80% of the participants reported never having read or looked at Manga comics. The schools in the Brooklyn neighborhoods in which the study was conducted (Crown Heights and East New York) have greater percentages of students eligible for free lunch (79% and 96%, respectively21,22) compared to the citywide average of 66%.23

Signed parental consent and student assent were obtained. Upon completion of the intervention, participants received small gifts (eg, stationery, school supplies) valued at $5. Approval from the Hunter College Institutional Review Board and participating after-school programs were received, with an expedited review.

Study Design

A 2-group, randomized pilot study was conducted in which each participant was assigned to either the Comic or Attention-control group. Participants in the Comic group read a 30-page Manga comic titled Fight for Your Right to Fruit, which was developed through extensive formative research. The formative research process consisted of in-depth interviews and focus group discussions, with the intended population, to determine the comic's storyline, concepts, and characters. In addition to health promotion messages embedded in the narrative comic, a 1-page non-narrative was included at the end of the comic to provide additional information about the benefits of fruit and to reinforce the comic's health messages. Although the comic is largely narrative, information was presented in both narrative and non-narrative formats, as entertainment-education research suggests a combination may be necessary for communication to be effective.24 The Attention-control group received a 5-page newsletter and a word search puzzle on a non-health-related topic, specifically ancient Greece and Greek mythology.

Measures and Instruments

The primary outcome variable was snack food selection measured by direct observation of participant selection of a healthy or unhealthy snack. The 4 fruit options (oranges, grapes, apples, strawberries) were categorized as "healthy," and the 4 energy-dense snacks (cookies, potato chips, nacho chips, and cheese-filled crackers) were categorized as "unhealthy." Direct observation of snack selection was conducted by the lead researcher, who also escorted each of the subjects to and from his or her classroom. She invited each participant to select a snack of his or her choice. During the selection process, she remained at a distance of approximately 10–15 feet away from the subject and the table where the snack options were displayed to minimize potential selection bias. The type of snack that was selected was noted on a separate form, after each participant was escorted back to their assigned classroom.

Secondary outcome variables included knowledge, self-efficacy, and outcome expectations related to fruit.
and fruit consumption, measured at baseline (on Day 1) and after snack selection (on Day 2). Knowledge was measured with 7 items, which addressed nutritional content and recommended servings of fruit. Self-efficacy and outcome expectations were each measured with 2 items. Self-efficacy items focused on the behavior of consuming fruit every day in a global sense rather than in relation to specific barriers, while outcome expectation items addressed health benefits relevant to fruit consumption. The scales used to assess knowledge were adapted from measures that had been previously tested for reliability in youth and were pilot-tested with the intended population, whereas the self-efficacy and outcome expectation measures were tested for reliability and predictive validity in previous studies with populations of similar age.

All items were rated on a 5-point scale ranging from Strongly Disagree (1) to Strongly Agree (5).

An additional secondary outcome variable, transportation, was measured to represent the degree to which participants were immersed in their media (on Day 2). The Transportation Scale, which is intended to capture major dimensions of transportation such as emotional involvement, cognitive attention, feelings of suspense, lack of awareness of surroundings, and mental imagery, included 11 general items and 1 imagery item related to the main character. All items were measured on a 5-point scale ranging from Not At All (1) to A Lot (5). Sample items for all the psychosocial measures are shown in Table 2.

Although 60 minutes were allotted for students to read their media, time spent reading was also collected for both groups. The time began when the youth were prompted to open their folders to begin reading their media and ended when they raised their hand to signal they had finished reading. The youth were not told that time would be measured to prevent potential bias against the quality of the reading experience.

**Data Analysis**

Descriptive analyses were conducted at baseline with respect to demographics and lifestyle indicators (eg, physical activity, Manga comic readership). The multiple logistic regression model was used to compare the primary outcome (healthy vs unhealthy snack selection) between the Comic and Attention-control groups, adjusting for age, sex, and fruit and vegetable intake in the previous week (consumed < 5 or ≥ 5 servings of fruit and/or vegetable). Within-group changes from pre- to posttest for knowledge, self-efficacy, and outcome expectations were examined using paired t tests. The multiple linear regression model was used to compare the secondary outcome of transportation between the 2 groups, adjusting for age and sex. All statistical tests were 2-sided, and a P < .05 was considered statistically significant. Statistical analyses were conducted with Stata 12.0 (StataCorp, College Station, TX, 2011).

**RESULTS**

Participant characteristics at baseline are shown in Table 1. There were no significant differences in characteristics between the 2 groups. Primary and secondary outcome variables are displayed in Table 2. Adjusting for age, sex, and previous-week fruit and vegetable consumption, Comic group participants were significantly more likely to choose a healthy snack, compared to the Attention-control group (Odds Ratio [OR] = 3.63, 95% Confidence Interval: 1.09–12.1, P = .04). Significant within-group changes in self-efficacy (P = .04), but no significant change in knowledge (P = .07), were observed in the Comic group; no changes were observed for outcome expectations. The Comic group participants also reported being significantly more transported by their media compared to those in the Attention-control group (P = .006). The Attention-control group exhibited no significant changes in any of the secondary outcome variables. The Comic and Attention-control groups spent an average of 16.4 minutes and 14.6 minutes reading their media.
media, respectively; no significant differences were observed between the 2 groups \( (P = .26) \).

**DISCUSSION**

As childhood obesity rates remain high, there is a need to design effective obesity prevention programs that are engaging for youth. The current study aimed to develop an intervention tool to facilitate behavior change by incorporating positive health messages into a popular form of media for the targeted age group.

The results suggest that the comic may have influenced snack selection, as the Comic group was more likely to have selected a healthy snack compared to the Attention-control group. To the best of the authors' knowledge, there have been no studies to date that evaluate the behavioral impact of a Manga comic with health messages. However, a recent study by Branscum et al did assess the change in fruit and vegetable consumption after participation in the *Comics for Health* program, in which youth created their own health-related comic strips, and found that fruit and vegetable consumption significantly increased for children ages 8–11 years.\(^9\) Similarly, a study by Baranowski et al reported that entertainment-education, in the form of video games, resulted in an increase in fruit and vegetable intake among children ages 10–12 years.\(^9\) However, these studies used self-reported behavior change, whereas the current study was able to measure behavior by direct observation of snack selection.

Previous research has also shown that people are more likely to perform a behavior if they have the self-confidence to believe they can carry out the behavior themselves.\(^9,15\) The present findings, in which the Comic group demonstrated a significant increase in self-efficacy for fruit consumption from pre- to post-test, were consistent with findings from the comic pilot study by Branscum et al.\(^10\) However, neither the investigators in the current study nor Branscum et al observed any changes in outcome expectations.\(^10\) The lack of change found in the current study may be because only 2 items were included in the scale, which could have limited its sensitivity to detect subtle changes. In addition, a single-session exposure of the Manga comic may not have provided a sufficient dose of the health messages to produce observable changes in outcome expectations.

Although the observed increase in knowledge in the Comic group was not significant \( (P = .07) \), the impact could be important, as the small sample \( (n = 57) \) had limited statistical power. The improvement in knowledge of the Comic group is promising, as knowledge has also been associated with dietary behavior change in youth.\(^35,36\)

Transportation into a narrative is believed to lead to persuasion of the story’s messages.\(^28\) The results from this study showed that the Comic group was more transported by their media (immersed into their media) than the Attention-control group. This finding further highlights the promise of Manga comics as health promotion media, as narratives that transport readers have been shown to change beliefs and motivate behavior change.\(^9,15\) The transportation measure may also provide some insight into the cognitive processes involved in influencing psychosocial variables through the Manga comic.

Results from the current study are promising; however, limitations of the pilot study should be noted. Explicit information was presented at the conclusion of the comic to reinforce health messages presented in the story. Therefore, it cannot be concluded whether the comic alone, the non-narrative information, or the combination of both narrative and non-narrative information influenced the observed health belief changes and snack selection. Another limitation is the lack of a comparison to a traditional form of health information, as the Attention-control group.
group read a non-health–related newsletter. Other limitations include the small sample size, limited statistical power, and the study design, in which the students were randomized within each of the 2 sites. Posttest data collection was conducted immediately after the youth read their materials, thus the long-term effects of the media are unknown. Also, observations of how the study participants engaged with their reading material were not documented, which could provide insight into how youth may process information presented in different formats. The generalizability of results is not clear, as the study was conducted in only 2 NYC neighborhoods. However, the study population was based in 1 of the most underserved communities within NYC, consisting predominantly of black/African American and Hispanic youth, who have disproportionately greater rates of childhood obesity than other ethnic populations.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The results of this pilot study suggest that Manga comics could be used to promote healthier behaviors and beliefs related to fruit consumption in at-risk youth. Manga comics are popular among US youth and can be easily disseminated, either in print or electronically. Furthermore, the graphics and minimal text make it a promising format to engage younger populations. While the mediators involved in media engagement are not fully understood, the findings from this study may suggest that transportation into narrative media like Manga comics and changes in self-efficacy may be important in facilitating behavior change. However, as this was a pilot study, replication studies with larger sample sizes are needed. Furthermore, research is needed to gain a better understanding of the key components of the comic that may have influenced behavior and corresponding belief changes related to fruit consumption and how they may differ from traditional forms of health messages.

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