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## Testing the Effectiveness of Narrative Messages Using Critical Health Communication

**Mi Zhou, PhD, MPH\* [Assistant Professor],**

Department of Nutrition, Food Science, and Packaging, San Jose State University

**A. Susana Ramírez, PhD, MPH [Associate Professor],**

Public Health Department, University of California Merced

**Deepti Chittamuru, PhD [Postdoctoral Researcher],**

Public Health Department, University of California Merced

**Dean Schillinger, MD [Professor],**

Division of General Internal Medicine and Health Communications Research Program, Center for Vulnerable Populations, Zuckerberg San Francisco General, Hospital and Trauma Center, University of California San Francisco

**Sandie Ha, PhD, MPH [Assistant Professor]**

Public Health Department, University of California Merced

### Abstract

**Background:** Latinos suffer from health disparities associated with excessive consumption of sugar-sweetened beverages. This study aimed to test the effectiveness of messaging using critical health communication approaches and delivered by two narrative modalities (video and comic book) with similar content that aims to empower Latinos to advocate for social change and to make individual behavior change related to sugary beverage consumption.

**Methods:** Participants (N=129 Mexican American women between 18 and 29 years) completed an online survey before and after exposure to an embedded stimulus. Participants were randomly assigned to a stimulus, a narrative message in video or comic book format, both developed using critical health communication approaches that focused on individual harms and social causes of sugary beverage consumption.

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\* **Corresponding author: Mi Zhou,** mi.zhou01@sjsu.edu, Phone: +1 (540)-808-6639, Postal address: 1 Washington Sq, San Jose, CA 95192, USA.

#### Authorship

MZ developed the study idea, collected and managed data, conducted the analyses, and wrote the manuscript; DC identified the intervention stimuli, developed and pre-tested the outcome measures; DS and SH assisted with data analyses, theoretical conceptualization, and critically revised the manuscript; ASR conceptualized the study, obtained the funding, and supervised the entire research process.

#### Declaration of conflicting interests

The Authors declare that there is no conflict of interest

#### Ethics statement

This study was approved by the institutional review board (IRB) of University of California on Merced March 23<sup>rd</sup>, 2018, with the reference number UCM15-0017.

**Results:** Paired sample t-test results showed that both narrative messages increased intentions to reduce sugary beverage consumption (Video:  $P < 0.01$ ;  $d = 0.43$ ; Comic:  $P = 0.03$ ;  $d = 0.28$ ). Both groups also demonstrated significant improvements in sugary beverage-related media literacy (Video:  $P = 0.01$ ,  $d = 0.34$ ; Comic:  $P = 0.05$ ,  $d = 0.25$ ), public health literacy (Video:  $P = 0.05$ ,  $d = 0.24$ ; Comic:  $P = 0.01$ ,  $d = 0.32$ ), and empowerment to engage in sugary beverage-related community movements (Video:  $P = 0.003$ ,  $d = 0.38$ ; Comic:  $P = 0.034$ ,  $d = 0.27$ ).

**Conclusions:** This study provides initial evidence indicating the effectiveness of narrative messages in two modalities using critical health communication for promoting individual behavioral intention and social activation in reducing sugary beverage consumption.

### Keywords

message modality; comic book; sugar-sweetened beverage; empowerment; graphic medicine; commercial determinants of health

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### Introduction

In the United States, health is typically framed as the result of individual behavioral choices. Food and beverage consumption, in particular, is often viewed as a series of personal decisions. Yet, dietary quality is often constrained by limitations related to access (e.g., income and geographic availability) and influenced by social and environmental context (e.g., community and policy factors and racialized, manipulative marketing practices).<sup>1,2</sup> The food, beverage, and restaurant industries specifically target Latino consumers with strategic marketing for their least nutritious products, primarily candy, sugar-sweetened beverages, snacks, and fast food.<sup>3</sup> These targeted marketing efforts are successful: sugar-sweetened beverages, including sweetened carbonated drinks, sweetened fruit juices, energy or sports drinks, and sweetened coffee and tea are the primary source of added sugar in American diets,<sup>4</sup> and Latinos have higher daily calorie intake from sugary beverages than their white/non-Latino counterparts.<sup>5</sup> Indeed, these high rates of sugary beverage consumption contribute to the disproportionate incidence of obesity, diabetes, and other diet-related diseases among Latinos.<sup>6</sup> To reduce diet-related disparities thus requires multi-level interventions recognizing that individual decisions are nested within specific social, cultural, environmental, economic, and political contexts.<sup>7</sup> Specifically, health promotion approaches that solely focus on individual behaviors are inadequate, both because they do not address the fundamental causes of health disparities, and because they do not present an engaging alternative to the very compelling corporate messaging that blankets particular communities.

In contrast, critical health communication approaches emphasize the significance of gaining a form of health literacy that, by raising critical questions and fostering reflection regarding the status quo, aims to move people to rally around a broader social cause.<sup>8-10</sup> Such approaches aim to correct social inequities and injustices that impact individuals' health and well-being. Therefore, critical health communication strategies can lead people to engage in activities that result in improved health for the overall community, while also promoting healthier individual behavioral choices.

Critical health literacy is an emerging construct that can be used to assess the effectiveness of critical health communication. Critical health literacy is measured at the individual level but assesses awareness and intention to engage with the social and environmental contexts that influence health. Critical health literacy is frequently mentioned in health communication and public health scholarship, but there is little agreement about how to operationalize the construct.<sup>11,12</sup> We argue that there are several dimensions of critical health literacy that can be influenced through strategic message design: media literacy, which enables people to critically analyze media content;<sup>13</sup> public health literacy, which captures the extent to which people recognize the structural determinants of health;<sup>14</sup> and empowerment, which we define as self-efficacy to engage with and influence their community to address a given problem.<sup>15</sup> We thus propose that critical health communication incorporating critical health literacy—the sum of these three components—can be considered a higher-order message effect that can be used to test the effectiveness of messages in empowering Latinos to confront the social and environmental drivers of sugary beverage consumption.

Successful public health interventions are strengthened by well-designed communication strategies, foremost among which is ensuring that the messages are appropriate for a specific target audience.<sup>16</sup> Tailoring that matches messages to audiences' demographics (i.e., age, race, gender), language cues, and/or aligns the appeal or style of the messages with key sociocultural values of the target population has been shown to enhance message effects and audience empowerment.<sup>17–20</sup>

Narrative structure—storytelling, rather than presenting facts in a purely informational manner, such as brochures or infographics that aim to educate or persuade based on facts, reasons, and evidence—is another strategy that can enhance message effectiveness. Narrative messages were shown to be effective in engaging the audience's mind and, especially, the audience's sense of agency.<sup>21</sup> Narratives take form as distinct modalities: dynamic, such as audio or video stories, and static, such as plain text stories or some combination of images and text (e.g., comic books).

Narrative videos have been adopted for health promotion, with some success: Recent meta-analytic research has found strong support for the causal effects of narratives;<sup>22,23</sup> however, these effects may be small or nonexistent relative to non-narrative or no messages.<sup>22,24</sup> In a global context, entertainment education approaches grounded in dynamic narrative structures, typically deployed as radio or television programs, have been harnessed to empower people to identify social and environmental inequalities and to take actions to change social norms.<sup>25–28</sup>

Static narratives have typically referred to text-based stories, but comic books containing pictures (photographs or illustrations) along with explanatory text have garnered increased attention from health communicators. The simplicity of comic book language and the flexibility of comic book design also allow messages to be conveyed in a culturally relevant manner.<sup>29</sup> Comic books are popular in Latino cultures and have been successfully used to disseminate public health information among Latino populations in the United States. For example, studies found that a comic book was more effective than a brochure at

reducing stigma about antidepressant medication and mental health care and in improving self-assessment, coping skills, and utilization of resources among potential and actual depression sufferers who are Latino.<sup>30,31</sup>

While both video and comic book modalities can add vividness to narrative message delivery, each form has distinct advantages and disadvantages that may make them more useful under distinct circumstances. Thus, testing for the effects of messages with substantially overlapping content delivered via different modalities can usefully inform campaign approaches. Therefore, the aim of the current study was to test the effectiveness of a culturally tailored, critical health communication-based narrative message delivered via two distinct modalities, video and comic book, in empowering and mobilizing Latinos to advocate for social change in and to engage in individual behavior change with respect to sugary beverage consumption. Our hypothesis was that both message modalities (video and comic book) would increase intentions to reduce sugary beverage consumption and critical health literacy.

## Materials and Methods

### Participants

Mexican American women were specifically recruited for several reasons. First, foods and food behaviors are critical expressions of culture that are highly specific at the country and regional levels. Prior research by the investigators has demonstrated the centrality of food in constructing a Mexican American identity.<sup>32</sup> Women between 18 and 29 years were enrolled because young adult women at this age often start making food purchasing and preparation decisions for themselves and their families. The study was conducted in English because English-language preference is a commonly used proxy indicator of acculturation, and greater acculturation – integration with mainstream U.S. culture – is associated with poorer dietary quality among Latinos.<sup>32</sup> Although the sample was not intended to be representative of all young Latinas in the United States, it is drawn from a uniquely diverse population (University of California, Merced) that roughly reflects the country's significant demographic shifts.<sup>33</sup>

The sample size was determined from power analyses related to the hypothesis with paired sample t-test using G\*Power version 3.1 (University of Passau, Passau, Germany, 2016). The calculation was based on a medium effect size Cohen  $d = 0.25$ , which generated a sample size of  $n = 100$  that provided a statistical power of 80% at  $\alpha = 0.05$ . Due to the potential loss of follow-up after randomization and exposure and the strict recruitment criteria illustrated above, an attrition rate of 30% was considered. Therefore, at least  $n = 130$  participants were needed to ensure statistical power.

### Procedures

This study was conducted online using Qualtrics survey software (Qualtrics, Provo, UT) and was set up for participant recruitment via the undergraduate student research participation pool of University of California, Merced. The prescreen function of the research participation system allowed enrollment based on the inclusion criteria, including

gender, age, and ethnicity. The study design was a pre-post experiment. All participants started with the baseline measures for individual intentions to reduce sugary beverage consumption and critical health literacy in response to targeted social marketing. Following baseline question completion, participants were randomized into one of two message conditions: 1) narrative video and 2) narrative comic book. Immediately after exposure to the message, participants were asked to answer the outcome measures for the second time, followed by demographic questions. This study was approved by the institutional review board (IRB) of University of California on Merced March 23rd, 2018, with the reference number UCM15–0017.

**Stimuli Identification and Development**—To identify content, we searched the videos from *The Bigger Picture*, an award-winning diabetes prevention campaign launched by the University of California, San Francisco’s Center for Vulnerable Populations in collaboration with the nonprofit organization, Youth Speaks.<sup>34</sup> This campaign produced narrative videos professionally based on poems created by youth artists of color with the purpose of encouraging and inspiring other youth and young adults, especially Latinos and African Americans, to identify the social and environmental forces that create and perpetuate obesity and diabetes, and to defy the beverage industry by consuming less sugar and by participating in advocacy efforts. The video “[A Taste of Home](#),” created and performed by a young adult Mexican American, Monica Mendoza, was selected as the primary stimulus. The publicly available 5-minute video is based on critical health communication by emphasizing the social and environmental influencers of individual dietary behavior choices, by incorporating Spanish language cues and sociocultural values (i.e., familism, respect, and social justice) among Latino communities, and by adopting a narrative format.<sup>35</sup> This video depicts the daily dietary behaviors of Monica’s family and shows that Coca-Cola became an “essential” drink of her family dinner as a result of deliberate targeting by the company. The video emphasized the racialized marketing of sugary beverages to Latinos and to Mexicans and Mexican Americans. The video ends with a powerful image of the author and narrator dumping 2-liter soda bottles while instructing viewers to find the memory of “home” without sacrificing their health.

To create a parallel print condition (with the exception of the sound effects of the video), a comic book company that specializes in scientific translation was invited to develop a 4-page comic book equivalent in content and imagery to the video. The comic book combined the spoken word poem with illustrations about this family’s dietary traditions as depicted in the video. The appearances of characters, the sequence of events, and the conveyance of values were illustrated in a fashion very similar to the video, although the images were portrayed in a stylized comic format. The comic book development process was iterative and included the comic book artists, researchers, and the poet, to ensure that the four pages of the comic book fully captured the essence of the original poem as well as the most salient images in the video. Figure 1 shows screenshots of the content and modality comparisons between the video and the comic book stimuli. Appendix A displays the entire comic book; the video can be viewed by clicking “[A Taste of Home](#).” The content equivalence of the video and comic book was validated among 19 members of targeted audience, as previously reported.<sup>36</sup>

## Outcome Measures

### Individual intention to reduce sugary beverage consumption

**Sugary Beverage Consumption Intention.:** We measured individual sugary beverage consumption intention using a 5-point, 1-item Likert scale adapted from Zoellner et al.<sup>37</sup> The items stated “I plan to reduce my consumption of sugar-sweetened beverages over the next 3 months.”

### Critical Health Literacy

**Media Literacy.:** Sugary beverage-related media literacy was measured using a 5-point, 8-item Likert scale adapted from Chen et al (Cronbach’s  $\alpha = 0.87$ ).<sup>38</sup> A sample item stated: “Sugary drink ads link drinking these beverages to things people want, like love, good looks, and power.”

**Public Health Literacy.:** Public health literacy was measured using 5-point and 6-item Likert scales adapted from The Rapid Risk Factor Surveillance System.<sup>39</sup> The 6 items measured opinions about how much different external factors affect health: (1) money, (2) education, (3) safe and affordable housing, (4) early childhood experiences, (5) government policies and programs and (6) system failures for the under-resourced (Cronbach’s  $\alpha = 0.88$ ).

**Empowerment.:** Empowerment was measured using a 4-point and 7-item Likert scale adapted from Zimmerman et al.<sup>40</sup> The scale comprised 3 subscales, namely (1) Community control (2 items; Cronbach’s  $\alpha = 0.63$ ); (2) Perceived effectiveness of actions to influence community decisions (3 items; Cronbach’s  $\alpha = 0.78$ ); and (3) Perceived difficulty (2 items; Cronbach’s  $\alpha = 0.82$ ). One sample item stated that “I can influence decisions that affect my community.”

**Demographic Data.:** Questions regarding ethnic origins and birthplaces of participants and their parents and grandparents adapted from Unger et al.<sup>31,41</sup> were also asked to ensure they self-identified as Mexican Americans. To make sure all participants were Mexican American, we first checked if participants had selected one or more options for “Mexican,” “Mexican American,” or “Chicana” in the multiple-choice ethnicity question at the end of the survey. If none of the three options were chosen, we checked if they were born in Mexico, followed by checking if at least one of their parents or grandparents was born in Mexico.

**Data Analysis—**The index of the overall scales and sub-scales generated by averaging individual items was included in the statistical analyses for each outcome. To test the intervention effects within each group, paired-sample t-tests were conducted to compare pre- and post-test scores for video and comic groups, respectively. The effect sizes for paired t-tests were reported as Hedge’s corrected Cohen’s  $d$  value. All analyses were completed using IBM SPSS Statistics for Windows (Version 27.0, Armonk, NY: IBM Corp) at 0.05 alpha level.

## Results

N=168 participants were screened and N=129 participants were included in the data analysis after removing participants who did not complete the survey or were not Mexican American. The mean age of participants was 20.5 years (SD = 1.6). Table 1 summarizes the pre- and post-test results for all outcomes. The analyses show a statistically significant post-intervention increase in individual intention to reduce the consumption of sugary beverages for the subsequent three months in both groups (Video:  $P < 0.01$ ;  $d = 0.43$ ; Comic:  $P = 0.03$ ;  $d = 0.28$ ). Both groups also demonstrated significant increases in critical health literacy outcomes, including sugary beverage-related media literacy (Video:  $P = 0.01$ ,  $d = 0.34$ ; Comic:  $P = 0.05$ ,  $d = 0.25$ ), public health literacy (Video:  $P = 0.05$ ,  $d = 0.24$ ; Comic:  $P = 0.01$ ,  $d = 0.32$ ), and empowerment to engage in community movements (Video:  $P = 0.003$ ,  $d = 0.38$ ; Comic:  $P = 0.034$ ,  $d = 0.27$ ).

## Discussion

Latinos comprise the largest ethnic minority group in the US, representing 18% of the total population.<sup>42</sup> They also are the main driver of demographic growth in the US.<sup>42</sup> Latinos disproportionately suffer from diet-related diseases compared to non-Hispanic whites. Therefore, identifying ways to support Latinos to change unhealthy dietary social norms and behaviors in the context of what often are unhealthy food environments is a critical component in improving US population health and reducing cardiometabolic health disparities. The current study is one of the first experimental studies to examine the effectiveness of critical health communication-based narrative videos and comic books in promoting health in the Latino community. The analyses found that the nutrition education delivered via both modalities was effective in increasing individual intentions to reduce sugary beverage consumption and in enhancing critical health literacy among female Mexican American young adults, with small to medium effect sizes. Despite a few discrepancies in significance for the pre- and post-exposure score changes (Table 1), the within-group analyses demonstrated roughly consistent education effects between the two narrative materials.

While this study was not designed to statistically compare the relative effectiveness or structural equivalence of the message modalities narrative video and comic book, the intervention effectiveness of both stimuli aligns with some of the prior research that has theorized about the narrative modality. With vivid and concrete images as well as voice and music, audiovisual messages may bring a richer experience to viewers and thus increase the transportation of message content (i.e., the extent to which the viewers are absorbed into the narrative world while forgetting their surrounding environments). However, print narratives may generate an equivalent or higher degree of transportation by requiring more cognitive effort and thus creating deeper mental images.<sup>43,44</sup> This theory was previously tested in a meta-analysis of narrative effects, which concluded that the medium or modality of the message presentation did not influence the magnitude of narrative persuasion.<sup>22</sup> Another controlled comparison of modalities of narrative video vs. infographic found that video narratives lead to higher cognitive and emotional involvement than their print equivalence,



but also result in higher psychological reactance, which can neutralize the benefits to some extent.<sup>45</sup>

Similarly, although the statistical comparison of the modality was not the main purpose of the present study, we did note some differences in the pre-post measures across modalities that suggest the need for future research to understand the potential differential impact of modality. For example, while the overall empowerment indices were significantly higher after viewing both the video and the comic book, the Community Control sub-scale was only significantly improved in the video group. In addition, the effect sizes for the pre-and post-increase of the sugary beverage consumption intention measurement and the Media Literacy index were both larger in the video group than in the comic group. On the other hand, the effect size for the pre- and post-increase of the Public Health Literacy index was large in the comic group but was medium in the video group. We reiterate that this study was not designed to adequately test these differences, but point out the differences to suggest opportunities for future research to test the equivalence or differential effectiveness with larger sample sizes and a control group.

While our study cannot determine the relative effectiveness of the two narrative formats, videos and comic books may have practical differences, and for these purposes, our findings that both are effective at changing individual-level behavioral intentions and self-efficacy to engage in civic action related to sugary beverages are highly relevant. For example, video offers lively experiences to audiences, but watching videos requires that audiences have access to high-speed internet with sufficient bandwidth, a requirement that may backfire when working with populations that experience health disparities that could be compounded by the digital divide.<sup>46</sup> Comic books, on the other hand, can be disseminated virtually (i.e., as an image file) or physically without such requirements. These attributes mean that comic books could be especially useful tools in public spaces where sound cannot or should not be shared, such as clinic waiting rooms. Comic books also can be strategically placed in community locations where audiences are somewhat captive and potentially primed to consider health-related messaging. Both modalities' content and message approach can be tailored to address specific cultural and social factors that affect dietary behaviors. Ideally, public health communication campaigns would utilize multiple modalities to ensure the greatest reach and to reinforce messages.”

Our study has a number of limitations. First, we did not measure actual behavior change. However, there is an evidence base establishing a significant correlation ( $r^2 = 0.38$ ;  $p < 0.01$ ) between intentions and behaviors, specifically in the context of sugary beverage consumption.<sup>37,47</sup> Second, the small sample size due to the limited number of eligible participants in the university research pool and participants were only recruited from one university potentially limit the generalizability of the study and undermined our ability to compare effects across modalities. Third, the lack of a control group makes causal inferences related to individual behavioral intentions and critical health literacy difficult.

Despite these limitations, our findings contribute to knowledge on how to design and test communication interventions to affect not only individual behavior change toward sugary beverage consumption but also to achieve social activation among Latinos related



to sugary beverage exposure and consumption. Our findings also contribute to health behavior and decision-making theories in that the intervention designs were developed using critical health communication that emphasizes the significance of a comprehensive understanding of multilevel influences on health behaviors. Finally, the findings contribute to health communication practice and policy, demonstrating how narrative approaches that use multiple types of media can meet the communication needs of underserved populations and help reduce health disparities.

## Conclusions

Nutrition communication strategies typically focus on individual change, overlooking the importance of social and environmental context in dietary behaviors. Using a pre- and post-intervention experimental design, this study provides initial evidence indicating the effectiveness of critical health communication-based narratives delivered via two distinct modalities for promoting individual behavioral intention and social involvement to reduce sugary beverage consumption among a population that experiences a significant burden of diet-related disease.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## Biographies

**Mi Zhou** is an assistant professor at the San Jose State University. Her current research explores the effects of food and beverage marketing and different communication media and technologies on health outcomes for underserved populations.

**Susana Ramírez** is an associate professor of public health communication at the University of California, Merced. She applies communication science to advance public health goals for rural and Latino populations and is a nationally recognized expert on media, inequality and dietary health, and Latinx culture.

**Deepti Chittamuru** is a postdoc researcher at the University of California, Merced. Her current research examines how technology might be leveraged to improve health outcomes for marginalized and underserved populations both globally and locally.

**Dean Schillinger** is a primary care physician, scientist, author, and public health advocate at the University of California, San Francisco. He is an internationally recognized expert in health communication and has been widely recognized for his work related to improving the health of vulnerable populations.

**Sandie Ha** is an assistant professor of public health at the University of California, Merced. Her research interests center on identifying and understanding environmental risk factors for adverse pregnancy outcomes and investigating how prenatal exposures affect subsequent health for both mothers and babies

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Figure 1. Screenshots of the Content and Modality Comparison between the Video and the Comic Book Stimuli



**Table 1.**

Cognitive and Behavioral Outcome Within and Between Group Comparisons, N=129

Cognitive and Behavior Outcomes	Within Group Comparison Mean (SD)							
	Video (N=64)				Comic (N=65)			
	Baseline	Post	<i>p</i> value <sup><i>b</i></sup>	<i>d</i> <sup><i>b</i></sup>	Baseline	Post	<i>p</i> value <sup><i>c</i></sup>	<i>d</i> <sup><i>c</i></sup>
Empowerment Index <sup><i>a</i></sup>	2.68 (0.31)	2.79 (0.36)	<.01 <sup>*</sup>	0.38	2.62 (0.41)	2.70 (0.37)	0.03 <sup>*</sup>	0.27
Community Control	2.90 (0.43)	3.05 (0.54)	0.04 <sup>*</sup>	0.26	2.88 (0.52)	2.92 (0.54)	0.50	0.09
Effectiveness of Actions	2.73 (0.56)	2.90 (0.61)	0.01 <sup>*</sup>	0.35	2.70 (0.68)	2.92 (0.63)	<.01 <sup>*</sup>	0.37
Perceived Difficulties	2.37 (0.68)	2.38 (0.69)	1.00	0.00	2.23 (0.63)	2.16 (0.69)	0.36	0.12
Public Health Literacy Index	4.26 (0.53)	4.35 (0.60)	0.05 <sup>*</sup>	0.24	4.31 (0.47)	4.45 (0.53)	0.01 <sup>*</sup>	0.32
Media Literacy Index	4.24 (0.59)	4.41 (0.56)	0.01 <sup>*</sup>	0.34	4.31 (0.46)	4.43 (0.47)	0.05 <sup>*</sup>	0.25
Intention to reduce sugary beverage consumption	3.70 (0.85)	4.03 (0.78)	<.01 <sup>*</sup>	0.43	3.92 (0.89)	4.11 (0.87)	0.03 <sup>*</sup>	0.28

\* Statistical significance for pre- and post-test score within video and comic groups, respectively

<sup>*a*</sup> the range of Empowerment Index and sub scales are 4, the range of other outcomes are 5

<sup>*b*</sup> p-values and effect sizes for video before and after intervention comparison

<sup>*c*</sup> p-values and effect sizes for comic book before and after intervention comparison