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Feasibility, Acceptability, and Effectiveness Pilot Study of a Culturally Adapted and Digitized Food-Focused Media Literacy Intervention: JUS Media? Global Classroom – Somali American

Tori S. Simenec[1] · Salma A. Ibrahim[1] · Sarah Gillespie[1] · Jasmine Banegas[1] · Gail M. Ferguson[1]

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Abstract
Acculturating immigrant and refugee adolescents are at risk for unhealthy eating and obesity through exposure to mainstream U.S. media featuring unhealthy food advertisements. Moreover, food marketing research shows that Black youth, including Black immigrants and refugees, are disproportionately targeted by U.S. junk food advertising. To help address this problem, this study evaluated the feasibility, acceptability, and effectiveness of JUS Media? Global Classroom – Somali American version (JMGC-SA), a culturally adapted, digital, food-focused media literacy intervention that promotes healthier eating for acculturating Somali American adolescents. This pilot study recruited 159 students in 7th–12th grades attending a Somali American charter school ($M_{age} = 15$, 47.8% girls) in the Midwestern United States. Students received the JMGC-SA video curriculum accompanied by two interactive activities. Primary outcomes of readiness to eat a healthier diet and food-focused media literacy were assessed before and after the intervention and analyzed using the Wilcoxon signed-ranks test. Predictors of acceptability were assessed and analyzed using Pearson correlations and *t*-tests. Implementation of JMGC-SA in school classrooms was found to be feasible with a retention rate of 85.55%. Students reported the program as acceptable overall (3.56/5) and across each cultural adaptation dimension (all means > 3.2/5). After participating in the intervention, students demonstrated significantly higher readiness to increase consumption of vegetables (Cohen's $d = 0.27$) and reduce dietary salt ($d = 0.20$). This brief, digital, culturally adapted, food-focused media literacy intervention for Somali American adolescents was found to be feasible, acceptable, and effective. Efficacy research and extension to other acculturating Black adolescents are the next steps.

Keywords Digital interventions · Cultural adaptation · JUS Media? Programme · Immigrant/refugee adolescents · Acculturation · Tridimensional acculturation

Introduction

In the twenty-first century, childhood obesity, and non-communicable diseases broadly, have become a major health challenge across the world (WHO, 2021; UNICEF, 2021). Two contributors to the increasing rates of childhood and adolescent obesity are the nutrition transition—a global increase in the consumption of unhealthy foods—and child-directed marketing of junk food[1] through media, which is especially prominent in U.S.-produced media (Popkin & Gordon-Larsen, 2004). Digital behavioral health solutions are needed to address these U.S.-based, media-mediated contributions to obesity. This is especially important for immigrant communities who are at increased risk for poor diet through acculturation to a prototypical U.S. diet, and for Black youth who are disproportionately targeted by fast-food advertisements (Dharod et al., 2011; Perez-Escamilla, 2011; Harris et al., 2019). Further, immigrant communities often encounter difficulties with access to and engagement with targeted interventions (de Anstiss et al., 2009). Therefore, accessible interventions specifically designed to support this

✉ Tori S. Simenec
sime0060@umn.edu

[1] University of Minnesota, 51 East River Parkway, Minneapolis, MN 55455, USA

[1] Junk food includes salty snacks and foods high in sugar such as desserts (Dunford et al., 2022).

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population in resisting unhealthy food depicted in media are especially urgent to promote their health and well-being and to decrease widening health disparities.

Acculturation to Mainstream White American Culture as a Risk Factor for Unhealthy Eating

Acculturation, the psychological changes in behavior, values, and identity that result from cross-cultural contact (Ferguson & Birman, 2016; Schwartz & Unger, 2017), can have implications for diet and health. An individual may acculturate to one or more cultures within their given context (Ferguson et al., 2023). Research on Tridimensional (3D) acculturation with Jamaican American and Somali American youth has shown that the majority (> 70%) are bi- or tri-culturally oriented to heritage, African American, and White American cultures (Ferguson et al., 2012; Ferguson & Bornstein, 2014; Simenec et al., 2022a). Strong orientation toward mainstream White American culture is linked to poor diet among youth in the United States (Dharod et al., 2011; Perez-Escamilla, 2011) and abroad (Ferguson et al., 2018). African refugee children often develop preferences for energy-dense, American foods in U.S. schools (Patil et al., 2009). Experimental research found that Asian American immigrants who experienced threats to their U.S. American identity subsequently endorsed a preference for stereotypically American foods (Guendelman et al., 2011). Consuming the prototypical White American diet can express identity and enhance belonging, particularly in the face of discrimination, but it also poses health risks to acculturating individuals.

Current State of the Literature

In a recent study, Plaisime and colleagues (2020) found that adolescents enjoyed and even preferred accessing health information through engaging and entertaining digital platforms. Such digital health programs hurdle barriers in seeking health services experienced by some adolescents, especially historically underserved populations such as minority and disadvantaged adolescents (Colucci et al., 2015). Digital interventions targeting diet and physical activity have demonstrated effectiveness in changing targeted health outcomes. In a systematic review of 27 digital interventions promoting nutrition and exercise behaviors in adolescents, interventions that included education, goal setting, self-monitoring, and parental involvement were associated with significant health behavior change (Rose et al., 2017). The digital interventions were delivered primarily through websites in addition to text messages, games, emails, and social media. Other digital intervention implementation strategies used to support adolescent and young adult nutrition include social media which supports communications among peers with similar goals, self-tracking of nutrition behaviors including diet logging and exercise, and gamification to deliver nutritional information in an engaging format (Chau et al., 2018; Holzmann et al., 2019). While digital interventions are an effective strategy for supporting healthy nutrition behaviors in adolescents, such interventions are most effective when they account for contextual factors that drive adolescent health behaviors (Hargreaves et al., 2022). In fact, nutrition interventions that are culturally tailored to their audience have been found to be more effective at increasing healthy food consumption than non-tailored messages in adult populations (Oenema et al., 2005; Casado-Aranda et al., 2022).

Food-Focused Media Literacy as a Transnational Protective Factor for Black Immigrant Youth

Culturally specific and tailored interventions targeting relevant nutritional risk factors for acculturating Black immigrant youth are currently lacking. Identifying the mechanisms driving the association between White American orientation and diet highlights contextually informed avenues for intervention. A study with remotely acculturating mother-adolescent dyads in Jamaica demonstrated that the dietary risk associated with White American orientation was mediated by time spent watching U.S. media, which promotes junk food culture through youth-directed advertising (Ferguson et al., 2018). However, higher levels of food-focused media literacy buffer the association between U.S. media enjoyment and poor diet (Ferguson et al., 2020), highlighting a potential protective factor. Importantly, Black immigrant/refugee youth oriented to African American culture are also exposed (and more directly so) to the food-focused advertising that disproportionately targets Black and Latinx youth in the United States (Harris et al., 2019). Therefore, cultural adaptations of nutrition interventions targeting food-focused media literacy have the potential to disrupt the shared risk factor of junk food advertising on maintaining a healthy diet, especially for youth with African heritage.

Somali American Culture and Diet

Somali refugees resettled in the United States in two waves across the mid and late 1900s to escape political oppression and civil unrest (Kaptejins & Arman, 2004), which presents a notable dietary shift driven by acculturation to an unhealthy mainstream American diet (Adekunle et al., 2021). Traditionally, Somali breakfasts include *anjeero* or *malawah* (sourdough or sweet pancakes) with tea, occasionally served with meat; lunch and dinner are the larger meals of the day, consisting of maize or *soor*, rice or pasta, with meat (goat, lamb, and fish), while vegetables are served in a salad or as part of the meal. Fruits like mango, guava, papaya, and particularly banana are consumed regularly with meals.

Given that many Somali refugees practice the Muslim faith, religion also influences eating habits, including avoidance of pork products and fasting during the Islamic holy month of Ramadan. As families acculturate tridimensionally in the United States, they often maintain aspects of the traditional Somali diet while increasing consumption of mainstream White American fast food and processed foods, which are new to their diets (Dharod et al., 2011). Black refugee youth oriented to African American culture during their 3D acculturation processes are likely to be disproportionately targeted by unhealthy food advertising (Harris et al., 2019). As such, Somali American immigrant-origin youth are especially likely to benefit from nutrition intervention programs that include discussion of these three cultural forces and race-based U.S. food marketing tactics.

Current Study

The purpose of the current study was to evaluate the feasibility, acceptability, and effectiveness of JUS Media Global Classroom – Somali American (JMGC-SA), an efficacious food-focused media literacy intervention that was digitized and tailored for Somali American adolescents (Ferguson et al., 2021, 2023). Somali American youth were selected for this pilot study due to discussions with community stakeholders that indicated both a need and desire for support with nutritious eating in this population. While Somali American youth are just one of several populations from the African diaspora whose nutrition habits are impacted by tridimensional acculturative processes, JMGC was culturally adapted for this cultural group first given the program developer's institution is co-located with the largest number of Somali refugee residents in the United States (Gale Family Library, 2023). By teaching Somali American adolescents food-focused media literacy skills, the program encourages youth to think critically about unhealthy food advertisements they see in the media, which prior research has demonstrated as an effective strategy for supporting acculturating Black youths' healthy eating transnationally (Ferguson et al., 2021).

The program was piloted in a classroom setting using a pre-post design. To our knowledge, this is the first study that measured acceptability of a program using the Ecological Validity Model (EVM) (Bernal et al., 1995), a widely used cultural adaptation framework, which aligns with the JMGC-SA cultural adaptation process (Simenec et al., 2022b). Although originally created for healthcare settings, the seven-module Framework for Reporting Adaptations and Modifications to Evidence-based Implementation Strategies (FRAME-IS) can be used to guide implementation of digital culturally adapted interventions like JMGC-SA (Mangale et al., 2023). Using FRAME-IS, implementation strategies in this pilot study ranged from surface level to more complex strategies that included various components such as flexibility of in-person or remote delivery and cultural considerations like flexibility for prayer time. These strategies acted on multiple levels of the organizational system (Miller et al., 2021) to improve the acceptability and feasibility of delivering JMGC-SA in a classroom-based setting. We expected that (1) participants who received JMGC-SA would find the program acceptable across all EVM dimensions and (2) relative to pre-test scores, students would have better post-intervention food-focused media literacy and increased intentions to eat a diet in accordance with local nutrition recommendations. This intervention was designed for both male and female-identifying adolescents in secondary school (both middle and high school) and was rigorously reviewed by the project team including teen advisors from the Somali American community as part of its cultural adaptation; therefore, no differences in gender, age, or immigration generation were expected in the program's effectiveness.

Methods

Participants

Participants were recruited from a Somali American charter school in a metropolitan area of the Midwestern United States from middle and high school health courses. In total, 159 students received the JMGC-SA intervention. All 159 students participated in Session 1 of the program whereas 136 students participated in Session 2 for a strong retention rate of 85.5%. Participants were an average age of 15.00 years (range 12–19 years; 47.80% self-reported gender as female; 42.30% U.S.-born). For those born outside of the United States, 26.40% were born in Somalia, 13.20% in Kenya, and 11.30% in Ethiopia (see Table 1).

Prior to the study, all parents of students in the participating health classes received an email with information about the JMGC-SA program being delivered in their child's classroom. The email described the study process and instructed parents to contact a study team member (a member of the Somali community who spoke Somali) if they did not want their child to participate in the study nor complete the questionnaires. Information was provided to parents in both English and Somali. No parents revoked consent. All students in attendance in the participating health classes were read the assent form aloud and offered the opportunity to ask the program facilitator questions about the study before providing assent. All students in attendance received the program. Six students did not assent to participate in the study—they

Table 1 Sample demographics and acceptability descriptive statistics

	M	SD	*N*(%)/range
Age	14.99	1.57	12–19
Gender			
Male			82 (51.60%)
Female			76 (47.80%)
Born outside of U.S			56 (57.70%)
Somali Identity (range 1–4)	3.62	.63	1–4
Acceptability[a] (range 1–5)	3.56	.63	1.76–5
Content	3.55	.72	1–5
Context	3.24	.87	1–5
Persons	3.32	1.03	1–5
Metaphors	3.63	.79	1–5
Goals	3.71	.85	1–5
Concepts	3.52	.84	1–5
Language	3.79	.8	1–5
Method	3.51	1.06	1–5

One participant indicated their gender as nonbinary

[a]Acceptability measured within each of the eight Ecological Validity Model dimensions (Bernal et al., 1995)

received the intervention as an approved school offering, but they did not provide data. Participating students received a $20 e-gift card to a vendor of their choice after completing both surveys involved in the study.

Intervention

The current study piloted the culturally adapted, digitized version of the JUS Media? Programme called, JUS Media? Global Classroom – Somali American (JMGC-SA). The purpose of this pilot study was to evaluate the feasibility, acceptability, and effectiveness of JMGC-SA in a classroom setting using a pre-post-test design. The digital program supports the core skill of food-focused media literacy in the context of 3D acculturation experienced by many Somali American adolescents (see Fig. 1 for a detailed outline of all intervention tasks). JMGC-SA includes five animated video modules that address (1) nutrition, (2) identifying advertisements, (3) 3D acculturation, (4) media literacy, and (5) subvertising (a strategy involving "spoofing" or satirizing advertisements that are used to encourage participants to think critically; Nelson et al., 2020). The 35-min animated program is accompanied by two interactive activities: creating a healthy meal using the U. S. Department of Agriculture's nutrition guidelines, and subvertising an unhealthy food advertisement. The program is designed to be delivered in school-based settings, whether in-person or online, and offers flexibility to be delivered in either one or two class periods.

Based on the school preference, we conducted the two-session JMGC-SA in-person across two 1-hour mandatory health classes from 7th through 12th grade, all conducted

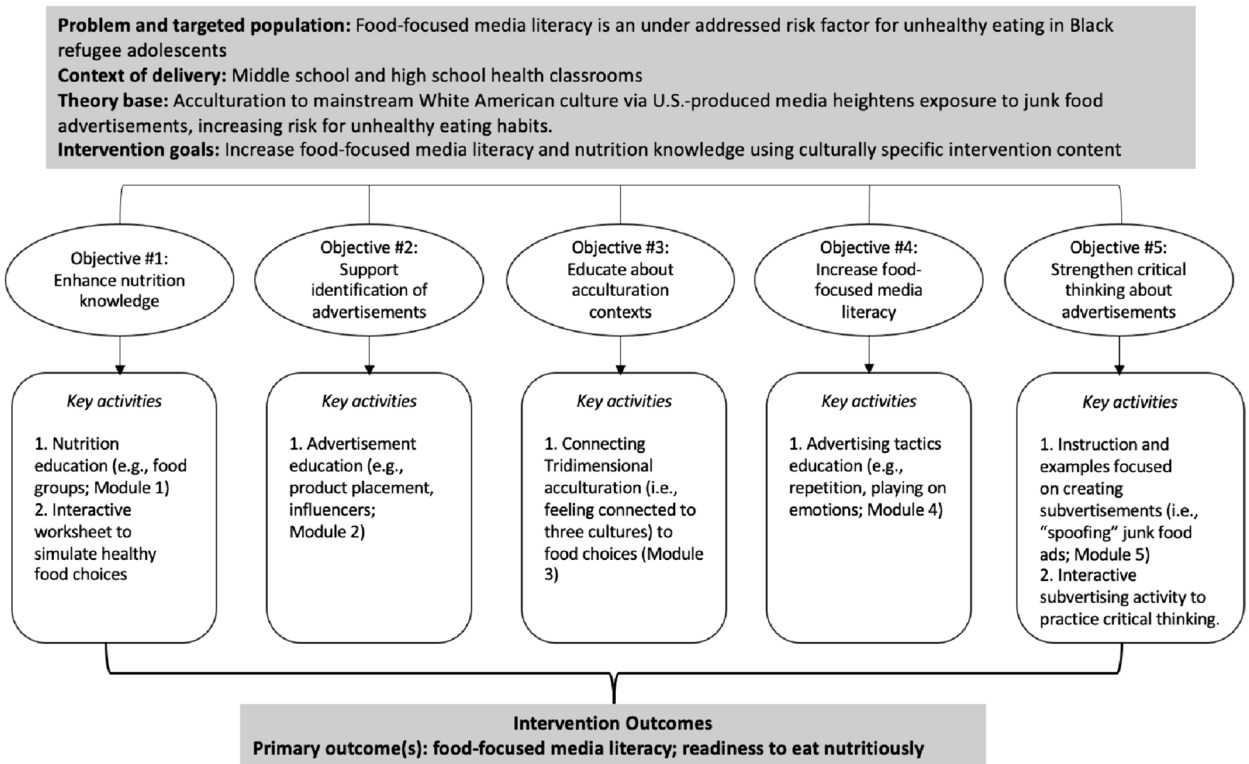

Fig. 1 Task analysis of the JUS Media? Global Classroom – Somali American

over the course of two non-consecutive days within one week. Classes were gender-segregated based on school practice in this cultural community. For program delivery, each JMGC-SA administration had a Black Somali American research assistant as a cultural insider leading the session along with an Asian or White non-Somali research assistant as a cultural outsider to assist. The use of cultural insiders as session leaders speaks to the importance of representational ethics to build rapport with the student demographic, including both newcomers and U.S.-born students (Abdi et al., 2022; Lorenzo-Blanco et al., 2023). Forming equitable relationships with community stakeholders is key to reaching refugee populations with culturally adapted services including the Somali American community (Abdi et al., 2022).

Session 1 involved an introduction to the program and the project team by the lead Somali research assistant, followed by the 15-min pre-test digital survey, then viewing the 35-min animated program, and ending with a preview of the activities for Session 2, scheduled for two days later. The second session included two activities that reinforced the skills taught in the video modules shown in Session 1, followed by the 15-min post-test survey. The first activity presented two fast-food restaurant menus and instructed students to build a healthy meal using the U.S. Department of Agriculture food plate. Students then shared their examples and engaged in a brief discussion on how they incorporated each food group into the meal. Next, students completed a subvertising activity in which they altered an unhealthy food ad to reveal the deceptive messages being used by advertisers (i.e., creating "subvertisements" that subvert misleading advertising tactics). This activity was done in student pairs to promote discussion and deeper critical thinking. Students then presented their subvertisements to their classmates.

Measures

Prior to data collection, a brief cognitive interviewing process was used to ensure clear and appropriate survey content for the participants' cultural and developmental levels by piloting surveys with a teen advisor from the Somali American community. The teen advisor indicated items within the survey that required clarification and provided suggestions for rephrasing and formatting to improve comprehensiveness.

Retention

Participant retention rate was measured by the number of students who completed both sessions, divided by the number of students who completed Session 1. This indicator was used to assess the feasibility of the intervention (Lewis et al., 2017).

EVM Acceptability

Acceptability was measured using a 21-item scale created by the study team to map onto each dimension of the EVM (Bernal et al., 1995). Creating items for each EVM dimension prioritized the content validity of the scale. Sample items include "I like the use of the Somali proverb (maah-maah)" to measure the acceptability of metaphors and "The people in the videos looked like me or someone in my community" to measure acceptability of persons. Participants responded using a 5-point Likert scale from "not at all" to "very much." Reliability was excellent for this measure overall (Cronbach's $\alpha = 0.91$) and reliability for most individual EVM dimensions was acceptable: content ($\alpha = 0.65$), context ($\alpha = 0.53$), persons ($\alpha = 0.75$), metaphors ($\alpha = 0.70$), goals ($\alpha = 0.74$), and concepts ($\alpha = 0.77$). While items measuring acceptability within the language dimension are expected to measure similar conceptual constructs, understanding the language used in the program is meaningfully different from the program being presented in the language students primarily use. This distinction supported the assessment of the use of developmentally appropriate language (i.e., understanding the content) as well as language preferences for bilingual speakers (i.e., content reflects the student's most used language). As such, these two items showed a weak correlation at $r = 0.24$. The method dimension was assessed using only one item. See the full scale with items listed in the Supplement. Dimension scores were calculated by computing the mean of items within each dimension.

Food Readiness

Food readiness before and after the intervention was measured using a readiness ladder assessing readiness to change eating habits (Wright et al., 2015). Four items were used to measure readiness to eat more fruits and vegetables and less sugary and salty foods (e.g., "How ready are you to have 2 or more servings of fruit per day?"), one item for each of the four targeted nutrition goals. In this study, participants were asked to assess the readiness of their responses on a Likert-like scale ranging from 0 (indicating "not ready") to 10 (indicating "ready"), with numerical ratings clustered corresponding to specific readiness levels (i.e., 0–2, 3–4, 5–6, 7–8, and 9–10). This measure was used successfully in the original JUS Media? Programme randomized controlled trial (RCT) in Jamaica (Ferguson et al., 2021). As per prior use, each item was used as a single item in analyses (i.e., measuring readiness to eat different food groups individually) rather than as a scale. Consistent with prior research involving the JUS Media? Programme and other research (Ferguson et al., 2021), we measured intentions/readiness to change eating habits because this is a 1–2 session intervention that does not allow time to accomplish significant

behavior change. However, based on the theory of planned behavior (Ajzen, 1991), which states that intentions are a reliable predictor behavior, health intentions have been empirically demonstrated to be strong predictors of health behaviors (Riebl et al., 2015).

Food-Focused Media Literacy

Media literacy was measured using a 14-item disagree-agree scale assessing students' perceptions of the meanings behind food advertisements, food representation in ads, and truth in food advertising (Powell, 2014). Participants responded using a 4-point Likert scale from "strongly disagree" to "strongly agree." Sample items include "fast food and snack food companies only care about making money" and "wearing a shirt with a fast food or snack food company makes you into a walking advertisement." This measure was used successfully in the original JUS? Media Programme RCT in Jamaica (Ferguson et al., 2021) and had adequate reliability in the current sample (αpre = 0.78, αpost = 0.79). A mean score was computed.

Heritage Culture Identity

To assess heritage cultural identity, participants completed a 4-item version of the Language, Identity, and Behavioral Acculturation Scale referencing Somali culture (Birman et al., 2010). This scale included items on their cultural identification with their heritage Somali culture such as, "I have a strong sense of being Somali." Participants responded using a 4-point Likert scale from "strongly disagree" to "strongly agree." The scale had adequate reliability in the current sample ($\alpha = 0.87$). A mean score was computed.

Data Analysis

Participants with post-test only scores were not included in the analysis as there was no way to verify that they received the Session 1 of the intervention. After excluding those data, the amount of missing data for participants at pre-test was 8.76%, and at the post-test was 23.34%. A Little's Test of Missing Completely at Random (MCAR) test confirmed by non-significance that the values were missing completely at random $\chi 2(9319.51)$, $p > 0.05$. Therefore, multiple imputation techniques were used to impute variables with missing values, and imputed values were aggregated across the five new datasets before analysis.

Pearson correlations and *t*-tests were then used to examine the association between sociodemographic variables and JMGC-SA acceptability ratings. Additionally, given non-normal distributions, Wilcoxon signed-rank tests were conducted to examine the intervention effects on food-focused media literacy and eating intentions. An alpha level of 0.05 was used across analyses.

Cultural Adaptation of JUS Media? Global Classroom

To increase the accessibility and cultural relevance of the original JUS Media? Programme, our team digitized and culturally adapted the program for Somali American adolescents (Simenec et al., 2022b). This new digital program was culturally adapted for Somali American adolescents to address food-focused media literacy skills in the context of their 3D acculturation experience (Simenec et al., 2022b). The cultural adaptation and digitization process was conducted in collaboration with members of the Somali American community, including teen advisors, using the novel blueprint storyboarding method developed by our team. Meetings with three teen advisors were conducted remotely using video conferencing and included the cultural adaptation lead (cultural outsider who is not Somali American: lead author) and cultural broker (cultural insider who is Somali American: second author) to provide their feedback on culturally tailored dimensions of the program. Additionally, teen advisors were prompted for periodic feedback on specific visuals in the program via WhatsApp messaging platform commonly used in this cultural community. A step-by-step description of the digitization and adaptation process is described in detail elsewhere (Simenec et al., 2022b). The EVM (Bernal et al., 1995) and cultural sensitivity framework (Resnicow et al., 2000) were used to guide the cultural adaptation of the digital program. Below we describe how each of the eight dimensions of the EVM and the surface- versus deep-level considerations were applied to culturally adapt the JMGC-SA.

Language

JMGC-SA was recorded in English given that most youths from the Somali American community are fluent English speakers. However, the script was adapted to reflect local phrasing and developmentally appropriate language. Additionally, the audio used for the animated characters was re-recorded by Somali American community partners to incorporate local voices.

Persons

JMGC-SA included two animated characters: a teacher and a student. These characters were selected to represent people familiar to youth engaging in the program whose characteristics, including clothing style, skin tone, and hairstyle, were selected based on input and approval from cultural consultants. The teen character represented a Black teen boy with a medium-brown skin tone wearing a casual, conservative, neutral-colored outfit, and the teacher character represented a Black female teacher of similar complexion wearing a hijab and conservative dress that are familiar in Somali American culture (see Fig. 2). The use of the hijab

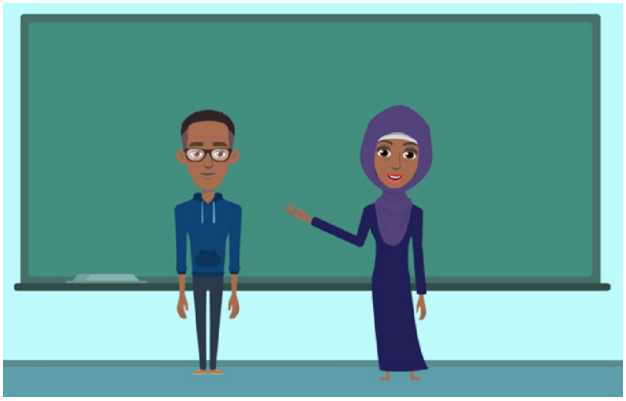

Fig. 2 Persons: student (left) and teacher (right) characters

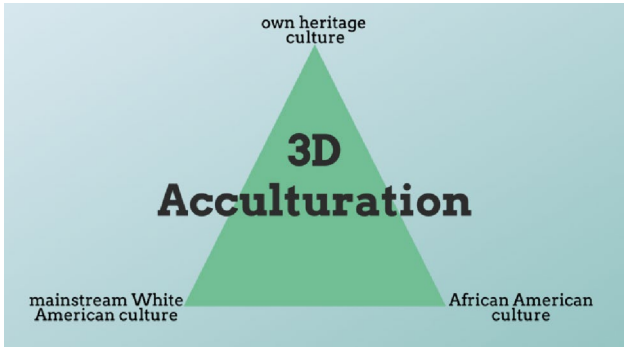

Fig. 3 Concepts: tri dimensional acculturation

was culturally specific to Somali American culture (predominantly Muslim) versus the original program designed for Jamaicans (predominantly Christian).

Metaphors

Like the JUS Media? Programme designed for Jamaican adolescents on the island, Somali American teen advisors stressed the importance of the Somali language and proverbs for conveying important lessons. The teen advisors suggested we draw on a Somali proverb to convey the concept that understanding how advertising works can diminish the effect it has on you, "Aqoonla`aanwaa iftiinla'aan: The absence of knowledge is the absence of light. Now that I can see the purpose of advertisements, I will be less influenced by them." This replaced a Jamaican proverb from the original intervention.

Content

Content areas requiring cultural adaptation in JMGC-SA included advertisements, influential figures, local nutrition recommendations, and various aspects of the scripts. For example, popular American food chains such as Dunkin Donuts, popular food delivery services, and local athletes, including LeBron James, are referenced replacing examples local to Jamaica.

Concepts

Identifying cultural beliefs and experiences that affect the program's target behavior helped to ensure that the program addressed core concepts unique to the Somali American community related to nutrition, food-focused media literacy, and acculturation experiences. As discussed above, prior research indicates that the process by which U.S. food advertisements influence unhealthy eating behavior differs for Black teens in Jamaica (remote acculturation) compared with Black immigrant and refugee teens in the U.S. (3D acculturation). As such, the acculturation module included 3D acculturation concepts, including how this national context impacts eating patterns through media exposure and race-related targeting (see Fig. 3).

Goals

Like the original Jamaican intervention, cultural collaborators, program creators, content experts, and cultural advisors advocated for the desirability of healthy eating for Somali American teens. Therefore, these goals were retained in the culturally adapted JMGC-SA.

Methods

Methods used to communicate intervention content communicated core concepts in an animated, digital format followed by two interactive activities. The program began by increasing knowledge about nutrition and advertisements, followed by the exercise of subvertising in which students "spoofed" an advertisement to reflect the true goals of the company or brand (e.g., profit), which was retained in the JMGC-SA adaptation given it is a key "active ingredient" of the program.

Context

Context adaptations included both cultural considerations (including 3D acculturation as described above) and environmental ones. By using a digital program designed for a school-based context, students could complete lessons individually on digital devices or in a classroom-based setting. This was essential in the era of the COVID-19 virus, where digitization of the program allowed for flexible access to all lesson materials from anywhere with internet access.

Surface-Level and Deep-Level Adaptations

Adaptations identified culturally specific content that fell along a spectrum of surface-level changes that required one-for-one matching of content (e.g., replacing Jamaican food with Somali food) to deep-level changes that required careful consideration of culturally specific mechanisms involved in intervention goals (e.g., developing new modules to address differing acculturation experiences).

Results

Intervention Feasibility

Feasibility was determined based on student participation and retention rates (Lewis et al., 2017). As mentioned previously, 159 students participated in Session 1 of the program (video lessons) and 136 of those students also participated in Session 2 of the program (interactive activities) resulting in an 85.55% overall retention rate. All eligible students present on the days of the intervention received the intervention; however, due to local COVID-19 pandemic conditions outside of school and researcher control, 23 students were absent on the day of Session 2. Chi-squared tests indicated that completion rates were not significantly associated with age, gender, or country of origin all $p > 0.05$.

Intervention Acceptability

Students who participated in the program found it to be acceptable with an overall mean acceptability scale score of 3.56 out of 5. Students also found the program to be acceptable within each of the EVM dimensions: content (3.55), context (3.24), persons (3.32), metaphors (3.63), goals (3.71), concepts (3.52), language (3.79), and method (3.51) (see Table 1).

Analysis of sociodemographic variables indicated a significant association between overall JMGC-SA acceptability ratings and both age ($r(154) = 0.19$, $p = 0.02$) and heritage culture identity ($r(157) = 0.2$, $p = 0.01$) with older students and students reporting closer connections to Somali culture finding the program more acceptable. Findings also revealed a significant difference in mean overall acceptability ratings by country of origin, $t(154) = 2.05$, $p = 0.04$, with students born in the United States finding the program significantly more acceptable ($M = 3.68$; $SD = 0.57$) than students born outside of the United States ($M = 3.47$; $SD = 0.67$; Cohen's $d = 0.37$). Within the EVM dimensions, age was positively associated with acceptability ratings in content ($r(156) = 0.19$, $p = 0.02$), context ($r(156) = 0.18$, $p = 0.03$), persons ($r(156) = 0.17$, $p = 0.03$), and concepts ($r(156) = 0.16$, $p = 0.05$). Connection with Somali culture was positively associated with content $r(159) = 0.17$, $p = 0.04$, context $r(159) = 0.17$, $p = 0.04$, and metaphors $r(159) = 0.28$, $p < 0.001$. Gender was not significantly related to acceptability ratings.

As a supplement, two open-ended questions were also used to assess program acceptability to students: "What did you like about JUS Media? Global Classroom?" and "What didn't you like about JUS Media? Global Classroom?" Overall, participants found JMGC-SA enjoyable (e.g., Participant ID 700 "The video wasn't one of those soulless informative videos you'd see playing during class") and informative (e.g., ID 2564 "it taught me new things"). Participants specifically noted aspects of the program they enjoyed within all the EVM dimensions: *content* (e.g., ID 2713 "I like how the Somali culture is used as an example"); *context* (e.g., ID 2256 "I liked how they included that a person can belong in more than one culture."); *persons* (e.g., ID 689 "One thing that I liked about JUS Media was the video of Gail Ferguson because it showed that even people outside the community cared about the nutrition of the community."); *metaphors* (e.g., ID 2491 "I like how they used the somali maahmaah [proverb]); *goals (e.g.*, ID 2826 "I like how it want to help people be healthy"); *concepts* (e.g., ID 2620 "it helped open my eyes to what the advertisements are selling me"); *methods* (e.g., ID 2222 "everything like watching the videos in the classroom"); *language* (e.g., ID 2887 "I liked how clear the messages of the presentations were."). Finally, while most comments were positive relative to negative, participants noted several aspects of the program they did not enjoy including the length (e.g., ID 2487 "it was kinda long") and the animation style (e.g., ID 700 "animation was weird").

Intervention Effectiveness

Nearly all mean outcome scores were higher after the intervention than before participation, and multiple score changes were statistically significant. Wilcoxon signed-rank tests indicated that post-test ranks were significantly higher than pre-test ranks for readiness to eat more vegetables ($Z = -3.41$ $p < 0.001$; Cohen's $d = 0.27$) and readiness to eat less salt ($Z = -2.54$ $p = 0.011$; Cohen's $d = 0.20$), with the increase in media literacy trending toward significance ($Z = -1.86$ $p = 0.063$; Cohen's $d = 0.15$) (see Table 2).

Discussion

Summary of Findings

The current study evaluated the feasibility, acceptability, and effectiveness of JUS Media? Global Classroom (JMGC-SA)—a digitized food-focused media literacy intervention

Table 2 Wilcoxon signed-rank test and Cohen's d for primary outcome variables

	Pre-test		Post-test			
Outcome variable (measure range)	M	SD	M	SD	*p*	Cohen's d
Readiness to eat more vegetables (1–5)	2.95	1.28	3.26	1.24	.00*	0.27
Readiness to eat more fruit (1–5)	3.70	1.51	3.70	1.33	.93	0.00
Readiness to eat less salt (1–5)	3.14	1.21	3.42	1.17	.01*	0.20
Readiness to eat less sugar (1–5)	3.37	1.26	3.46	1.14	.45	0.06
Media literacy (1–4)	2.91	0.48	2.95	0.47	.06	0.15

M mean, *SD* standard deviation

*$p < .05$

which was culturally adapted for Somali American adolescents in the United States. The study found that JMGC-SA was both feasible (85.55% retention rate) and acceptable (3.56/5 overall rating) for Somali American middle and high school students using school-based delivery methods. Moreover, findings support the effectiveness of this brief digital intervention at increasing food-focused media literacy and intentions to eat a healthy diet with small but significant effects (Cohen's $d = 0.20–0.27$). This suggests the efficacy of the original in-person JUS Media? Programme extends to the digital version and to other populations.

Findings from the current pilot study of JMGC-SA reinforce and extend related literature suggesting the benefits of digital culturally adapted interventions. The feasibility of a program indicates the extent to which the intervention can be successfully implemented in a given context with a specific population (Lewis et al., 2017). The 85.55% retention rate in the current study indicates that the delivery of digital interventions in a classroom is particularly advantageous given the average retention rate for digital programs delivered through other settings such as websites or apps is 79% (Liverpool et al., 2020). This finding of the program's feasibility supports other research suggesting that school-based interventions serve as a useful strategy for serving refugee adolescents (Simenec & Reid, 2022). By tailoring the intervention to align with both the developmental stage and cultural context, JMGC-SA incorporated nutrition and media literacy content directly relevant to Somali American adolescents. This aspect of the culturally adapted digital program likely contributed to its acceptability and effectiveness. Older students, those who reported a stronger Somali cultural identity, and students born in the U.S. found JMGC-SA to be especially acceptable. This finding is supported by other research suggesting that orientations toward cultural beliefs, such as familism in Latinx populations, influence acceptability ratings of culturally adapted interventions (Cameron et al., 2017). Further, messages more closely aligned with an individual's worldview are more effective at creating change in targeted health behavior than non-tailored messages (Noar et al., 2007) and tailoring is a key design feature mediating the effectiveness of digital interventions (Morrison et al., 2012).

Implications

Findings from the current study suggest implications for research and practice. This was the first known study to align the EVM cultural adaptation framework (Bernal et al., 1995) used in cultural tailoring with measures of acceptability. The development of this scale is important given the sparsity of systematic documentation on cultural adaptation of interventions (Simenec et al., 2022b) and the lack of measures designed to assess the acceptability of cultural adaptations using the guiding adaptation framework. As such, future research should continue to explore factors related to acceptability within each EVM dimension and how they can be used to better tailor interventions for cultural communities. For example, this finding suggests the need to measure cultural orientation, not only static demographic variables such as birthplace, to understand for whom intervention programs are acceptable.

In the era of COVID-19 and other public health threats, digital programs such as JMGC-SA that can be delivered in a hybrid, remote, or in-person format are of increasing importance to maintain program feasibility and acceptability in highly dynamic educational contexts. Identifying effective JMGC-SA implementation strategies to ensure tailoring based on the school environment and the contextual realities of the participants is critical. In this pilot study, we prepared for flexible/in-person delivery depending on current COVID-19 policies, solicited and incorporated teacher feedback, and embedded culturally specific strategies (e.g., Somali-American co-facilitators, flexibility for prayer time, English language support, gender-specific classrooms). Overall, considering appropriate implementation strategies such as these supports the feasibility and acceptability of digital culturally adapted programs (Graham et al., 2020). Using video technology to implement intervention and prevention programs in high-income countries like the United States, is ideal for addressing structural racism and other factors that drive health inequities in these contexts, including but not limited to food deserts, economic marginalization, and food insecurity, and discrimination within the health care system (Bailey et al., 2017; Houston et al., 2021).

Limitations

This study suggests JMGC-SA is feasible, acceptable, and effective; however, results should be interpreted in light of some limitations. First, this study was designed as a small effectiveness pilot with no comparison groups of students not receiving the intervention. Therefore, although the findings are consistent with prior efficacy research on the JUS Media? Programme, JMGC-SA efficacy can only be determined with a future experimental study. Next, Somali American intervention participants were recruited from the largest population of Somali Americans in the United States and participants spanned multiple grades and time in the country; however, they were all recruited from a single Somali charter school. Therefore, future research can replicate these with Somali American students in multicultural schools and in other regions if possible (although recruitment is expected to be more challenging in less dense ethnic communities). Finally, outcome data were collected immediately following the program, which limits understanding of the long-term outcomes, including delayed effects. Future studies can assess long-term outcomes of change in eating behavior after participating in JMGC-SA.

Conclusion

The current study confirmed the feasibility, acceptability, and effectiveness of the newly digitized, culturally adapted food-focused medial literacy intervention for Somali American adolescents: the JUS Media? Global Classroom – Somali American. These findings suggest that the use of the digital technology through an entertaining, engaging, and culturally tailored design supports the feasibility and acceptability of preventative programming. Further, study findings suggest the usefulness of interventions using a 3D acculturation framework to address contextual factors impacting health behaviors such as unhealthy eating for Black immigrant youth. The next steps include an extension of the intervention to other acculturating Black immigrant youth in the United States and a larger efficacy study of the newly digitized version of the program. With the ever-increasing consumption of digital media across multiple platforms, the importance of supporting adolescents in processing the inundation of targeted advertising is a pressing public health issue. As the United States has reached a majority-minority tipping point in the youth population (Frey, 2022), it is essential for researchers, practitioners, policy makers, and other professionals working with youth to continue to develop and prioritize culturally informed and accessible programs to support the healthy development of acculturating adolescents. Unhealthy eating is just one of many important targets of intervention for adolescents that require accessible and culturally informed programming, and digital school-based programs like the JUS Media? Global Classroom can help meet this need.

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Author Contribution All authors contributed to the study conception and design. Material preparation was performed by Tori S. Simenec, Salma A. Ibrahim, and Jasmine Banegas, with consultation from Gail M. Ferguson. Data collection was facilitated by Gail M. Ferguson and performed by Tori S. Simenec and Salma A. Ibrahim. Analysis was performed by Tori S. Simenec and Sarah Gillespie. All authors contributed to the writing of the manuscript led by Tori S. Simenec and all authors critically reviewed manuscript drafts. All authors read and approved the final manuscript.

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Declarations

Ethics Approval This study was approved by the University of Minnesota Institutional Review Board (12–07-2021/ STUDY00014673).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare no competing interests.

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