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**U.S. Media Enjoyment without Strong Media Literacy
Undermines Adolescents' and Mothers' Efforts to Reduce Unhealthy Eating in Jamaica**

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Abstract

We investigate whether media literacy and media use can moderate the association between U.S. media enjoyment and unhealthy eating among remotely acculturating “Americanized” adolescents and their mothers in Jamaica ($n=164$ individuals/82 dyads; $M_{\text{adolescent.age}}=12.83$, $SD=0.48$, 48% female; $M_{\text{mother.age}}=39.25$, $SD=5.71$). Socioeconomically diverse participants completed questionnaires reporting their degree of enjoyment of U.S. media (i.e., remote acculturation), media literacy (i.e., critical thinking about food media/advertising), and adherence to national dietary guidelines to reduce sugar/fat. Multi-level modeling showed that enjoying U.S. media and consuming high levels of U.S. TV plus Jamaican TV are associated with lower efforts to reduce sugar and fat. However, high media literacy, whether one’s own or a close family member’s, weakens or nullifies that association. (Word Count: 116/120)

Keywords: Western Media; Media Literacy; Diet/Nutrition; Obesity; Globalization; Remote Acculturation

U.S. Media Enjoyment without Strong Media Literacy

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Rates of overweight and obesity among children and adolescents in high-income countries have plateaued, but figures continue to rise in low- and middle-income countries (NCD Risk Factor Collaboration, 2017). The nutrition transition towards an unhealthy Western diet featuring processed foods high in sugar, fat, and salt is one factor fueling this obesity pandemic, and Western media plays a prominent role (Popkin, Adair, & Ng, 2012). A recent international meta-analysis of 29 experimental studies demonstrated that unhealthy food marketing in mass media targeting youth increases their consumption of energy dense, low nutrition foods and beverages (Sadeghirad, Duhaney, Motaghipishe, Campbell, & Johnson, 2016; also see Folkvord, Anschutz, Boyland, Kelly, & Buijzen, 2016 for a relevant review).

The Caribbean region has experienced an explosion in access to U.S. media, fast food, and consumer products (Ferguson, Fiese, Nelson, & Meeks Gardner, 2019) and now has one of the highest adolescent mean BMI scores (NCD Risk Factor Collaboration, 2017). What is more, many Jamaican adolescents and some of their parents have become strongly identified with U.S. culture via a process called *remote acculturation* and tend to watch more U.S. cable television and eat more unhealthily than peers (Ferguson, Muzaffar, Iturbide, Chu, & Meeks Gardner, 2018). The good news is that awareness of the manipulative intent of food advertising, otherwise known as *media literacy*, may be able to disrupt the influence of U.S. media on the unhealthy eating habits of adolescents. This has been demonstrated among American youth in the United States (Nelson, 2016), but not among remotely acculturating “Americanized” youth elsewhere. Therefore, this study uses cross-sectional data to examine whether media literacy and media use

moderate the association between U.S. media enjoyment and unhealthy eating patterns among remotely acculturating “Americanized” adolescents and mothers in Jamaica.

Remote Acculturation

Remote acculturation is a modern form of acculturation arising from indirect and/or intermittent contact with distant non-native cultures via modern globalization whereby some individuals can adopt behaviors, values, or identities from one or more cultures in which they have never lived, holding them alongside local cultural identities and behavioral styles (Ferguson & Bornstein, 2012). Like traditional immigrant acculturation, also referred to as proximal acculturation, remote acculturation is a bi/tri/multidimensional process allowing multiple cultural affiliations to varying degrees rather than an “either-or” choice (Ferguson, Iturbide, & Raffaelli, 2019), and it can occur in one or more domains of life including one’s behavioral preferences, values, and/or identity (see Ferguson, Tran, Mendez, & van de Vijver, 2017). Remote acculturation, therefore, aligns with the tenets of polycultural psychology that cultural affiliations are now plural (not singular) and partial (only some components of any given culture are internalized versus all) (Morris, Chiu, & Liu, 2015). The current study examines remote acculturation in the behavioral domain, with a specific focus on the component of preference for U.S. media because this component of remote acculturation has been demonstrated in prior research to be positively associated with unhealthy eating (Ferguson et al., 2018).

Adolescence is a sensitive period for remote acculturation because there is a developmentally normative emphasis on identity exploration, including ethnic/cultural identities (Erikson, 1968; Phinney, 1990), and the adolescent brain enters a new phase of environment-driven plasticity (Spear, 2013). In early adolescence, many societies start granting youth more autonomy than they had as children and this affords them greater exposure to new ideas and

cultural forms at a time when they are more open and plastic to these influences than they will be as adults (Brown & Larson, 2002; Spear, 2013; Zimmer-Gembeck & Collins, 2003).

The initial studies of remote acculturation were conducted in Jamaica, a nation with significant remote cultural influx from the United States due to trade (e.g., imported goods), technology (e.g., U.S. cable television saturation), tourism (a prime industry in Jamaica), and transnationalism (i.e., significant back-and-forth travel of family members to the United States; see Ferguson et al., 2017 for review). In two studies in Jamaica, Ferguson and Bornstein (2012, 2015) demonstrated that upwards of one in three urban adolescents could be characterized as “Americanized Jamaicans”. Relative to their culturally “Traditional Jamaican” peers, Americanized Jamaican youth or “Jahmericans” as they are called by Jamaican youth (Ferguson et al., 2019), reported greater enjoyment of U.S. media, stronger agreement with U.S. family values, and stronger endorsement of a U.S. identity alongside a proud Jamaican identity. One in ten of their mothers also demonstrated an Americanized Jamaican profile (Ferguson & Bornstein, 2012). Findings from qualitative focus groups with a subset of these families showed that their view of U.S. culture derived mainly from mainstream European American norms observed through U.S. media (Ferguson & Iturbide, 2013). Therefore, henceforth, the terms U.S. culture and U.S. media will be used to refer to the European American mainstream.

Remote acculturation and nutrition in Jamaica. Although both U.S. and Jamaican cultural streams are involved in remote acculturation in Jamaica, prior empirical research with adolescents and mothers has shown that it is orientation to U.S. culture that is associated with unhealthy eating in Jamaica, not their Jamaican orientation (Ferguson & Bornstein, 2015; Ferguson et al., 2018). Therefore the current study focuses on U.S. culture orientation as a predictor. According to Ferguson and colleagues’ framework of remote acculturation variables

outlined in Figure 1, the high status, availability, and convenience of U.S. consumer products in Jamaica (acculturation conditions) naturally fuels enjoyment of U.S. cable TV along with conscious or unconscious adoption of U.S. dietary attitudes and preferences (acculturation orientations), which in turn promote unhealthy eating choices (acculturation outcomes; Ferguson, Tran, Mendez, & van de Vijver, 2017). In line with this, a remote acculturation study with 238 adolescents in Kingston showed that a stronger European American orientation was correlated with eating more U.S. fast food and beverages (Ferguson & Bornstein, 2015). Building on that finding, a subsequent study using a new cohort of 330 adolescents and their mothers in Kingston found that daily time spent watching U.S. cable TV cross-sectionally mediated the positive association between U.S. orientation (enjoying U.S. media and identifying as American) and the frequency of eating unhealthy food after accounting for socioeconomic status (Ferguson et al., 2018). Enjoyment of U.S. media has also been associated with the propensity for unhealthy eating in other countries including South Africa (Ferguson & Adams, 2015), Thailand (adolescents report that eating at American fast food restaurants is cool: McKenzie, 2018), and India (Rao et al., 2013).

Not surprisingly, mothers' behaviors have been shown to play a role in remotely acculturating adolescents' food choices. Specifically, mothers' U.S. media engagement (Ferguson et al., 2018) and their difficulty finding time for joint family meals (Giray & Ferguson, 2017) have both been positively associated with adolescents' unhealthy eating choices in Jamaica using actor-partner interdependence modeling. In summary, remote acculturation, Americanization in particular, is a psychocultural determinant of health that puts some Jamaican adolescents and mothers at greater risk of unhealthy eating by increasing their daily U.S. cable time, which exposes them to more junk food advertising known to promote poor eating habits.

Media Landscape and Marketing in Jamaica

U.S. cable television (TV) is ubiquitous throughout Jamaica, far outstripping the number of local channels and programming (Gordon, 2009), and many U.S. fast food outlets have become established in urban centers. Jamaicans primarily view TV via foreign stations (Forbes, 2010), and U.S. cable packages are most common. Due to codes from the Jamaican Broadcasting Commission, the satellite feeds with hundreds of channels come directly from the U.S. with U.S. programming and advertising intact and no opportunity for localization (Gordon, 2009). This means that Jamaican adolescents and families watching U.S. cable on the island are exposed in real time to the same food and beverage ads as are U.S. families, most of which feature foods low in nutritional value and high in fat, sugar, and sodium (Sadeghirad et al., 2016; Vilaro, Barnett, Watson, Merton & Matthews, 2017). Research has shown that this is not a benign media environment for adolescents, who are developing lifelong nutritional habits. Ferguson and Bornstein (2015) found that Americanized Jamaican adolescents in Kingston watch significantly less local Jamaican TV and significantly more U.S. TV than their culturally traditional peers, and also consume significantly more U.S. fast food/ beverages. Therefore, U.S. media is a predictor of interest in this study.

Beyond TV, a recent study found that about 27% of all outdoor advertisements along three major transportation hubs in Kingston featured a food or beverage, typically energy dense foods such as processed foods, sugary drinks, and fast food restaurants, from both Jamaican brands and U.S./global brands (Nelson, Ahn, Giray, Ferguson, 2017). Additionally, one in four local Jamaican newspaper advertisements featured a fast food restaurant with Kentucky Fried Chicken (KFC) as the most frequent advertiser, followed by Burger King, then Pizza Hut (Ahn,

Nelson, & Ferguson, in press). Similarly, the majority of in-store and in-restaurant signage and point-of-purchase displays promote less healthy foods (Nelson et al., 2017).

The impact of this media/advertising-saturated landscape on adolescent nutrition in Jamaica is of particular concern for a few reasons. First there is the sheer volume: adolescents get a double dose by being exposed to both Jamaican and U.S. media and advertising on a daily basis. Second, the adolescent brain is particularly reactive to emotion-arousing media (Crone & Konijn, 2018) and emotional appeals are a principal tactic of food advertising targeting youth (Page & Brewster, 2007). This is compounded by the fact that inhibitory control lags behind in the developing adolescent brain (Spear, 2013), making it difficult for adolescents to fend off these advertising tactics. There is also innovative research also elucidating the role of subconscious cognitive processing including attentional biases among children exposed to food advertising (Folkvord, Anschütz, Wiers, & Buijzen, 2015; see Folkvord et al., 2016 for review).

Media Literacy and Media Use

Prior research documenting the concerning association between remote acculturation and unhealthy eating has not yet taken into account the level of media literacy and the potential for awareness of advertising persuasion to moderate this association. Media literacy, “the ability to access, analyze, evaluate, create and act using all forms of communication” (National Association for Media Literacy Education, n.d.), is one form of persuasion knowledge (Nelson 2016), and includes understanding the persuasive intent of advertising, recognizing bias, developing skepticism, and knowing the tactics and creative appeals (i.e., the Persuasion Knowledge Model–PKM: Friestad & Wright, 1994). Developing such knowledge about persuasion and the ways in which media works can better equip individuals to cope (e.g., ignore, counter-argue) with a persuasion attempt in the marketplace.

The PKM model has been used to understand and predict how children, adolescents, and adults develop and respond to persuasion attempts (e.g., Boush, Friestad, & Rose, 1994). The theoretical assumption is that in instilling media literacy or knowledge of the persuasion process can build resistance against the unwanted media effects. This view represents the “protective” view of media literacy that focuses on resisting negative media effects (Austin, 2013; Hobbs, 2011). Research conducted in the U.S. has shown that adolescents with higher media literacy (after a media literacy intervention) are more likely to show increased resistance to food marketing as well as healthier food habits (e.g., increased consumption of fruits and vegetables: Austin et al. 2018). In another study, adolescents with higher media literacy (after an intervention) were more likely to resist commonly advertised less healthy food (i.e., less likely to select the sugary cereal) and more likely to list healthy snacks compared to their counterparts with lower media literacy (Bickham & Slaby, 2012).

The amount of time spent watching media is another factor to consider as a potential moderator of the link between remote acculturation and eating habits. The association between increased media time and obesity has been widely studied, with support for this positive relationship from observational and experimental studies (see review by Robinson et al., 2017). For example, among U.S. adolescents aged 13-15, “attention to TV” was found to be a key factor in increased obesity risk as measured by BMI (Bickham et al., 2013). The ubiquitous food advertising embedded within TV is one factor that explains this association, with the idea that increased exposure to messages promoting processed snacks, soda, and fast food will influence the audience through social learning (e.g., social cognitive theory: Bandura 1994) and persuasion effects (e.g., Folkvord et al., 2016). On the other hand, there is some evidence that if children are restricted from viewing commercial media in line with a restrictive parent mediation approach

(i.e., enforcement of rules on media time and content), they will not have the experience or understanding of advertising (i.e., advertising literacy or persuasion knowledge) to recognize it or to develop appropriate coping mechanisms (Nelson et al., 2017). In this case, less exposure to commercial media could make the young audience more susceptible to food messages when they are encountered. In Jamaica, Ferguson et al. (2018) found that media use (as measured by daily U.S. media hours) indirectly linked U.S. media enjoyment to unhealthy eating for adolescents and mothers, but it is also possible for media use to function as a moderator that exacerbates the effect of U.S. media enjoyment on unhealthy eating choices.

Current Study

There is mounting evidence that globalization is linked to shifts from traditional to Westernized diets among adolescents across countries (e.g., Jensen, 2011; McKenzie, 2018; Rao et al., 2013). In Jamaica, despite national policy priorities targeting healthy nutrition (Stennett, Meeks Gardner, & Ferguson, 2017), nearly three in four adolescents drink soda at least once per day and nearly one in three adolescents are overweight or obese (Atkinson, 2017). Remote acculturation theory pinpoints an individual difference – U.S. media enjoyment – that puts some Jamaican adolescents at even higher risk of unhealthy eating (Ferguson et al., 2017).

Additionally, taking a bioecological systems lens, this process unfolds in the proximal family context and Jamaican mothers' U.S. cable viewing has been found to be associated with their adolescents' unhealthy eating (Ferguson et al., 2018). Therefore, in the current study we use a sample of early adolescents and their mothers in Jamaica to examine whether media literacy and U.S. media use (one's own and one's partner's) moderate the association between U.S. media enjoyment and progress toward reducing unhealthy eating. We hypothesized that media literacy will moderate (buffer) the association between U.S. media enjoyment and efforts to reduce

dietary sugar and fat. We refrained from a specific prediction regarding the moderation effect of time spent using U.S. media and Jamaican media, however, given that too much exposure (e.g., social learning and persuasion from food advertising) and too little exposure (effects of parental restriction) could prompt unhealthy eating habits.

Methods

Participants

Following IRB approval in the United States and Jamaica, 152 seventh graders and their mothers responded to recruitment and were screened from three traditional secondary schools in Kingston that serve a geographically and socioeconomically diverse area across three parishes. Mothers were selected for this study because they by and large manage nutrition in the home, and research in Jamaica shows that their media and nutrition habits are linked to their adolescents' (Ferguson et al., 2018). Participants provided parental consent and adolescent assent then completed brief screening surveys, based upon which 92 eligible dyads were enrolled. Screened dyads were excluded if the adolescent or mother endorsed the lowest levels on all three screening measures: U.S. media enjoyment ("none or none at all"), U.S. TV watching ("1 hr or less per day"), and fast food and sugar-sweetened beverages consumption ("none" or "one time every week"). To ensure demographic prerequisites for remote acculturation, adolescents/mothers were also excluded if they: were not born in Jamaica, were not a Jamaican citizen, were a citizen of the United States, had not lived in Jamaica for the past 15 years (mother) or 8 years (adolescent), did not live together, or if the mother had been primary guardian for <5 years. For 10 of these dyads, at least one person had significant missing data (and imputing that much data was undesirable).

Therefore, the analytic sample comprised 82 socioeconomically diverse adolescents ($M_{\text{age}} = 12.83$ years, $SD_{\text{age}} = 0.48$) and their mothers ($M_{\text{age}} = 39.25$, $SD_{\text{age}} = 5.71$). Mothers' education ranged from "less than 7th grade" (2.7%) to "graduate professional degree (e.g., MS, MD, PhD)" (17.6%), with the mode being "Technical/vocational program or started university" (30.5%) (adapted from Hollingshead, 1975). To assess SES, a common instrument in this cultural context was used where participants checked 20 household possessions adding one extra point for each additional phone or vehicle beyond one. The sample range was 1 - 31 possessions (adapted from Wilks, Younger, McFarlane, Francis, & Van DenBroeck, 2007).

Measures

U.S. Media Enjoyment. A brief 3-item version of the European American Orientation Scale from the Acculturation Rating Scale for Jamaican Americans was used (e.g., "*I enjoy White American TV/movies/music*": Ferguson, Bornstein, & Pottinger, 2012; see Ferguson et al., 2018 for validation information in a prior sample of adolescent-mother dyads in Jamaica). Participants responded on a 5-point likert-type scale ranging from 1 (none or not at all) to 5 (very much or always) and a scale mean was computed ($\alpha_{\text{adolescent}} = .81$, $\alpha_{\text{mother}} = .82$).

Media Literacy. A 14-item scale assessed critical thinking skills about food advertising and related media (Powell & Gross, 2018). In line with principles of media literacy, items covered the messages/meanings of advertising (e.g., "*There are often hidden messages in ads*") and representations versus reality in advertising (e.g., "*Fast food ads show happy, healthy, slim people to make people forget about the health risks*"). Participants responded on a 4-point scale ranging from 1 (strongly disagree) to 4 (strongly agree) and a scale mean was computed ($\alpha_{\text{adolescent}} = .75$, $\alpha_{\text{mother}} = .84$). Given that this scale had not previously been used in Jamaica, a confirmatory factor analysis was performed showing excellent fit for adolescents and mothers:

$\chi^2/\text{dfs} < 1$, CFI $> .99$, RMSEA $< .001$ (where acceptable fit was defined as $\chi^2/\text{df} < 3$, CFI/GFI $> .90$, RMSEA $< .06$: see Byrne, 2010).

Media Use. Participants reported their daily time spent watching U.S.-produced cable TV and Jamaican-produced TV on a typical weekday and on a weekend in the past month using four items from the HABITS questionnaire, two for each culture (Wright et al., 2011). The prompt for U.S.-produced TV was “*In the past month, how much did you watch American-produced TV programs on a WEEKDAY/WEEKEND? (for example Nickelodeon, Lifetime, CNN, Reality TV, Sports, etc.)*” and a 4-point Likert-type scale was used: 1 (0–1 hr), 2 (1 hr), 3 (2 hr), and 4 (3+ hr). Cultural labels and examples were adjusted for Jamaican TV items “...Jamaican-produced TV...*(for example Rising Star, Smile Jamaica, School’s Challenge, etc.)*.” A mean score was calculated for each culture. This measure is an index rather than a scale (i.e., media use on weekdays often differs substantially from weekends so both are important to capture for validity). Therefore, internal reliabilities are expected to be moderate ($\alpha_{\text{adolescent}} = .55, .61$, $\alpha_{\text{mother}} = .69, .73$ for U.S. and Jamaican TV, respectively). This measure was used in a prior sample of adolescent-mother dyads in Jamaica (see Ferguson et al., 2018), which confirmed that participants were easily able to distinguish between U.S.-produced TV and Jamaican-produced TV and to parse out time spent watching each type.

Stage of Change Towards Reducing Unhealthy Eating. Participants’ adherence to two food-based dietary guidelines of the Jamaica Ministry of Health was measured: “Reduce intake of sugary drinks and foods” and “Reduce intake of fats and oils” (<http://moh.gov.jm>). Participants responded to two items (i.e., “*Do you currently cut down your intake of sugary drinks and foods? (e.g., soda, sugar-water, pastry)*” and “*Are you currently cutting down your intake of fats and oils (e.g., margarine, cooking oil, ackee)*?” using a 6-point scale from Wright

et al. (2015): 1 - precontemplation stage (*No, I do not intend to cut down [insert food] I consume*); 2 - contemplation stage (*No, I am thinking about cutting down...but not just yet*), 3 - preparation stage (*No, I am thinking about cutting down...in the next month or so*); 4 - action stage (*Yes, I have been cutting down... for less than 6 months*); 5 - maintenance stage (*Yes, I have been cutting down...for 6 months or more*); and 6 - total abstinence (*I do not consume...*).

Results

Preliminary Analyses

SPSS 25 and AMOS 24 were used for analyses. There was a small amount of missing data in the analytic sample and missing values were missing completely at random according to Little's 'Missing Completely At Random' (MCAR) test, which was non-significant for both adolescents, $\chi^2(2706)=2014.15, p=1.00$, and mothers, $\chi^2(2290)=1645.86, p=1.00$. Thus, missing values were multiply imputed and the resulting values were aggregated across imputations to perform analyses. A repeated measures MANOVA showed significant differences between adolescents and mothers across study variables: Wilks' $\lambda = .37, F(6, 76)=21.43, p=.000$, partial eta squared =.63. Adolescents reported higher U.S. media enjoyment ($M_{\text{adolescent}}=3.66, SD=1.01$; $M_{\text{mother}}=2.88, SD=0.95$; $F(1, 81)=29.31, p=.000$), whereas mothers reported higher media literacy ($M_{\text{m}}=3.14, SD=0.46$; $M_{\text{a}}=2.84, SD=0.40$; $F(1, 81)=31.40, p=.000$), dietary sugar reductions ($M_{\text{m}}=3.96, SD=1.11$; $M_{\text{a}}=3.21, SD=1.12$; $F(1, 81)=18.75, p=.000$), and dietary fat reductions ($M_{\text{m}}=3.94, SD=0.92$; $M_{\text{a}}=3.19, SD=1.07$; $F(1, 81)=26.42, p=.000$). In regard to daily TV hours, mothers reported higher Jamaican TV hours ($M_{\text{m}}=2.63, SD=1.0$; $M_{\text{a}}=2.18, SD=.92$; $F(1, 81)=14.81, p=.000$) but adolescents and mothers did not differ in their U.S. TV hours ($M_{\text{m}}=2.61, SD=1.00$; $M_{\text{a}}=2.60, SD=1.10$, ns).

Intraclass correlations showed that there was greatest interdependence between adolescents' and mothers' daily U.S. media time ($r=.41, p=.000$), daily Jamaican TV time ($r=.40, p=.000$), and their media literacy ($r=.36, p=.000$). Consistent with prior research, U.S. media enjoyment was positively correlated with daily U.S. media hours for both adolescent and mothers ($rs=.33, .29, p=.002, .007$), and adolescents who used more U.S. media daily reported exerting less effort to reduce their dietary fat ($r= -.24, p=.033$). Adolescent who watched more hours of Jamaican TV had lower media literacy ($r=-.26, p=.020$) and mothers' Jamaican TV time was associated with lower sugar reduction efforts ($r=-.31, p=.005$). Interestingly, the more U.S. media adolescents used daily, the more their mothers were trying to reduce their own dietary fat ($r=.23, p=.041$). Household possessions (SES) and adolescent gender were included as covariates in main analyses. See Table 1 for intercorrelations among all study variables.

Main Analyses

Multilevel modeling (MLM) with restricted maximum likelihood was used to estimate actor-partner interdependence moderation models using our dyadic data (APIMoM: Garcia, Kenny, Lederman, 2015) because MLM is the recommended approach to APIMoM for samples under 100 dyads (Lederman & Kenny, 2017). APIMoM allowed us to test whether individuals' own media literacy or media hours (actor effects) or their adolescent's/mother's media literacy or media hours (partner effects) moderated the association between their remote acculturation and their eating habits. Six APIMoM models were run, the first four of which examined U.S. media enjoyment (1 predictor) and media literacy or daily U.S. media hours (2 mixed moderators) predicting dietary sugar and fat reductions (2 outcomes), with each combination in a separate analysis (4 models total). Two other two APIMoM models examined daily U.S. media media hours (predictor) and daily Jamaican media hours (1 mixed moderator) predicting dietary sugar

and fat reductions (2 outcomes). Dyads were treated as distinguishable and “person” was designated as a repeated measure and effect coded to ease interpretation of interactions: adolescent (-1), mother (1). Predictors were grand-mean centered. Based on our hypothesis, only actor effects for the predictor (one’s own U.S. media enjoyment) were used to create interaction terms with actors’ and partners’ values of the moderator (e.g., own U.S. media enjoyment X own media literacy/partner’s media literacy X own U.S. media hours/partner’s U.S. media hours).

MLM provides no test of absolute fit for APIMoM models, but relative fit was assessed for each model by comparing the -2 Log Likelihood (-2LL) to an empty model applying the ‘smaller is better’ rule and also using significance tests of model deviance to confirm that the actor and partner effects in the each model explained significantly more variance in the outcomes than before these effects were accounted for (Garcia et al., 2015). The fit of these models was also compared to full models containing both actor and partner predictors, and in all cases the deviance between the hypothesized model and the full model was not significant, indicating that a model with fewer interaction effects fit just as well as a model with more interactions. Significant interaction effects found were disaggregated using follow-up MLM analyses and results were graphed. Per APIMoM recommendations, non-significant terms were not trimmed but retained in each model (Garcia et al., 2015).

Media Literacy as Moderator. *Dietary sugar.* As expected, the hypothesized model fit the data better than an empty model, $\chi^2(15)=34.15, p<.01$, indicating that the actor and partner effects accounted for significant variance in dietary sugar reductions. Results showed that there was a statistically significant main effect of person ($b=.42$), $t(81)=3.442, p=.001$, with mothers having higher scores. There was also a significant three-way interaction between U.S. media enjoyment, media literacy, and person in the hypothesized direction ($b= -.52$), $t(147)= -2.66$,

$p=.009$ (see Table 2). Specifically, only for adolescents with low media literacy did U.S. media enjoyment negatively predict their efforts to reduce dietary sugar ($b = -.38$), $t(38) = -2.29$, $p=.028$ (see Figure 2). In other words, those adolescents with greater U.S. media enjoyment but less critical media skills were less likely to report reducing their sugar consumption. There was no parallel effect for adolescents with high media literacy ($b=0.5$, ns) nor for mothers with low or high media literacy ($bs = -.09, .45$, ns). There were also no significant partner effects, meaning that dyadic partners' U.S. enjoyment did not predict the other person's efforts to reduce dietary sugar. All effects modeled accounted for 18.2% of the variance in participants' dietary sugar reductions: pseudo $R^2=.182$.

Dietary fat. As expected, the hypothesized model fit the data better than an empty model, $\chi^2(15)=41.62$, $p<.001$ (pseudo $R^2=.286$) indicating that the actor and partner effects accounted for significant variance in dietary fat reductions. There was a statistically significant actor effect of U.S. media enjoyment such that adolescents and mothers who enjoyed U.S. media more were putting less effort into reducing dietary fat, ($b = -.26$), $t(147) = -2.830$, $p=.005$). There was also a significant two-way interaction between one's own U.S. media enjoyment and one's partner's media literacy, lending partial support to our hypothesis ($b=.48$), $t(141)=2.283$, $p=.024$ (table available upon request). Specifically, U.S. media enjoyment negatively predicted efforts to reduce dietary fat only for those whose mother/adolescent had low media literacy ($b = -.56$), $t(154) = -.52$, $p=.000$, but not for those whose mother/adolescent had high media literacy ($b = -.01$), $t(153) = -.10$, ns . That is, those adolescents with greater U.S. media enjoyment who had mothers with less critical media skills and vice versa were less likely to be putting effort into reducing their fat consumption. See Figure 3.

U.S. Media Use as Moderator. *Dietary sugar.* The model fit the data better than the empty model, but there were no significant effects besides a main effect of person as explained above, ($b=.35$), $t(82)=3.326$, $p=.002$. Therefore, the association between U.S. media enjoyment and dietary sugar reduction did not vary based on daily U.S. TV time.

Dietary fat. The model fit the data better than the empty model, but there were no significant effects besides a main effect of person as explained above, ($b=.29$), $t(80)=3.37$, $p=.001$. Similar to the results for dietary sugar, the association between U.S. media enjoyment and dietary fat reduction did not vary based on daily U.S. TV time.

Jamaican media use moderating U.S. media use. The fit of the model predicting dietary sugar was better than the empty model, $\chi^2(15)=34.41$, $p<.01$ (pseudo $R^2=.189$) indicating that the actor and partner effects accounted for significant variance in dietary sugar reductions. In addition to the same main effect of person ($b=.40$), $t(81)=4.322$, $p=.001$, there was a significant three-way interaction between daily U.S. TV hours, daily Jamaican TV hours, and person, ($b=.20$), $t(145)=2.15$, $p=.034$ (see Table 3). However, follow-up analyses showed that differences between adolescents and mothers did not meet the significance threshold for dietary sugar.

The fit of the model predicting dietary fat was better than the empty model, $\chi^2(15)=52.57$, $p<.001$ (pseudo $R^2=.264$) indicating that the actor and partner effects accounted for significant variance in dietary fat reductions. The same main effect of person appeared ($b=.39$), $t(83)=5.136$, $p=.001$. There was also a main effect of U.S. daily TV hours ($b=-.197$), $t(136)=-.241$, $p=.017$, that was better explained by a three-way interaction between daily U.S. TV hours, daily Jamaican TV hours, and person, ($b=.24$), $t(140)=2.99$, $p=.003$. Specifically, higher U.S. TV hours were associated with lower efforts to reduce dietary sugar only among adolescents who also had high Jamaican TV hours ($b=-.47$), $t(41)=-2.992$, $p=.005$ (see Figure 4). There was no

parallel effect for adolescents with low Jamaican TV hours ($b = -.11$, *ns*) nor for mothers with high or low Jamaican TV hours ($bs = .16, -.25$, *ns*).

Discussion

Summary

Given that nearly 1 in 3 adolescents in Jamaica are overweight or obese and nearly 3 in 4 drink soda one or more times daily (Atkinson, 2017), there is a critical need to identify modifiable protective factors for adolescent nutrition, which will in turn reduce risk for chronic non-communicable diseases. Remotely acculturating “Americanized” adolescents and mothers in Jamaica who enjoy U.S. cable TV, and are therefore subjected to embedded junk food advertising, have been shown to be at higher risk for unhealthy eating (Ferguson et al., 2018). Adolescents in Jamaica may be particularly vulnerable to the persuasive impact of junk food advertising because they get a double dose of daily media from the local culture and the imported U.S. culture. In addition adolescent brains are highly reactive to emotion and reward yet lack commensurate inhibitory control (Crone & Konijn, 2018; Spear, 2013). U.S. food advertisers exploit this vulnerability by using significantly more emotional appeals (e.g., promising ‘super-charged’ fun, happiness, or fantasy) than rational appeals (e.g., health or flavor claims) in TV ads targeting youth on broadcast networks (Page & Brewster, 2007).

Therefore, the purpose of this study was to examine whether for remotely acculturating “Americanized” families in Jamaica media literacy acts as a protective factor by moderating the association between U.S. media enjoyment and efforts to reduce unhealthy eating. We also examined the potential moderating roles of U.S. and Jamaican daily TV time. Findings largely supported hypotheses in that high media literacy (one’s own and one’s partners’s) acted as a buffer of the association between U.S. media enjoyment and unhealthy eating habits.

Additionally, Jamaican TV time compounded the negative association between U.S. TV time and adolescents' dietary fat reduction.

High Local + Remote Media Use = Risk Factor for Diet

Although only U.S. TV time and not Jamaican TV time as linked to lower efforts to reduce unhealthy eating habits, high levels of both were problematic for adolescents' diets. This finding supports the explanation that social learning (Bandura 1994) and persuasion effects (e.g., Folkvord et al., 2016) occur due to increased exposure to ubiquitous food advertising messages promoting unhealthy foods embedded within TV programs. There is strong support from observational and experimental studies for the positive association between increased media/TV time and obesity (see review by Robinson et al., 2017). Our interaction findings may reflect the sheer volume of food marketing exposure adolescents experience from Jamaican and U.S. influences in their global environment. Alternatively, this finding may point to the unique persuasiveness of unhealthy eating messages confirmed by two different cultural sources.

Media Literacy Buffers Diet Against U.S. Media Enjoyment

Study findings in Jamaica demonstrate that U.S. media enjoyment in the absence of strong critical media skills, whether one's own skills or those of a close family member, appear to dampen efforts towards adopting healthy dietary guidelines among remotely acculturating youth and mothers. Our findings are in line with a protectionist view of media literacy, where increased persuasion knowledge about media messages can equip individuals with the tools to better recognize persuasion tactics, develop critical thinking and skepticism, and counter argue or resist such media effects (Nelson, 2016). U.S. study findings supporting this view show that adolescents with higher media literacy (after an intervention) are more likely to show increased resistance to food marketing, healthier food habits (Austin et al. 2018; Bickham & Slaby, 2012),

and greater resistance to commonly advertised unhealthy foods (i.e., sugary cereal) compared to their counterparts with lower media literacy (Bickham & Slaby, 2012).

Individual-Level Risk but Individual and Family-Level Protection

Two 3-way interactions arose in the findings, both of them being actor effects for adolescents: media use emerged as an individual-level risk factor for dietary fat in one analysis (Figure 4) and media literacy emerged as an individual-level protective factor of efforts to reduce dietary sugar in another (Figure 2). It may be that acculturation and media use factors play a larger role in adolescents' efforts regarding reducing fatty foods relative to sugary ones. Importantly, the buffering effect of media literacy also took the form of a family-level partner effect, meaning that its protective quality was also enacted at the family level (see Figure 3). The presence of actor and partner effects emphasizes that media literacy is a family affair, and suggests the added benefit of family-level intervention involving mothers along with adolescents. Even if an adolescent's media literacy is limited, a mother can buffer her adolescent's eating habits by having high media literacy herself, and vice versa.

Family plays a key role in transmitting values and practices from shared family experiences and discussions related to consumption and media (Moore, Wilkie, & Desrochers, 2017). Indeed, parent mediation practices such as active mediation (i.e., parent-directed discussion about media and possible effects) may influence media literacy skills (e.g., Livingstone, 2002; Mendoza, 2009; Nathanson, 2002). For example, research has shown that increased media literacy training among parents can increase their ability to foster critical thinking about food marketing in their children, and as a result, their children show increased resistance to the influence of food marketing (Austin et al., 2018). Our findings here support those U.S. findings in a novel cultural context. Results also underscore that adolescents are not

necessarily passive recipients of media influences or parental mediation of those influences; many are also agentic drivers whose media literacy benefits their parents.

Limitations and Future Directions

Multilevel modeling was used because it is well-suited to APIM analyses in modest sample sizes, and study findings supported hypotheses (Ledermann & Kenny, 2017). However, although there was adequate power to detect a medium average actor effect across the adolescents and mothers, there was minimal power to detect differences between the adolescent and the mother in those effects. Therefore, future studies with larger samples can replicate and extend these findings, especially probing potential interaction effects that may be stronger for one partner than the other. Also, findings apply to urban Jamaican youth and mothers given that remote acculturation is largely an urban phenomenon related to globalization in urban settings (Ferguson et al., 2017). Findings may differ among out-of-school adolescents and for fathers-adolescent dyads, both of whom have been under-studied. It should also be noted that although self-reports can be subject to biases; they are necessary to capture intrapsychic processes such as one's remote acculturation and one's stage of change towards a goal. In addition, this study focused on U.S. media preference as a major component of remote acculturation in the behavior domain for conceptual and empirical reasons, but subsequent studies can consider whether identity and values domains of remote acculturation play a role.

The current findings supported hypotheses with actor and partner effects suggesting that both adolescents and mothers in Jamaica may benefit from media literacy training to disrupt the problematic links between their enjoyment of U.S. media, dual media use across two cultural worlds, and their eating habits. The inundation of the island in U.S. cable means that limiting the availability of media to youth and families is not a viable option. Therefore, teaching skills to

boost resilience in the midst of U.S. media saturation is likely to be a more successful intervention approach. The experience-dependent plasticity of the adolescent brain (Spear, 2013) presents a golden opportunity for media literacy training. Although adolescents are not naturally wired to combat the barrage of food advertising targeting them, media literacy training can strengthen their critical thinking about food advertising and support the development of inhibitory control to allow better decision-making about food choices, especially if it engages their drive towards autonomous choices versus passive consumption.

Transdisciplinary approaches that integrate nutritional sciences, media literacy, remote acculturation, and developmental science show promise in addressing these complex issues. For example, the authors have been involved in developing media literacy in Jamaica that enables youth and their parents to build upon cultural strengths of resistance and self-empowerment through a process of subvertising (Nelson, Tian, Powell, & Ferguson, 2019). Subvertising refers to subverting advertising by making fun of or spoofing ads in order to reveal their persuasion intent. In Jamaica, youth revel in this process as it aligns with cultural and developmental principles of resistance and autonomy, respectively. Rather than tell adolescents what is good for them in terms of diet and media influences, this approach has the advantage of allowing them to discover for themselves how they can become informed consumers (Ferguson et al., 2019).

Implications and Contribution

Enjoyment of U.S. media in Jamaica, which is a feature of remote acculturation to U.S. culture, and high daily consumption of U.S. and Jamaican TV are associated with lower efforts to reduce unhealthy eating. However, high media literacy, whether one's own or that of a close family member, weakens or nullifies that association. Our results indicate that a media literacy training intervention to subvert the influence of U.S. food advertising would be a viable avenue

to promote healthy eating in this population, and may have potential for other adolescent health risk behaviors associated with remote acculturation (e.g., smoking: Lorenzo-Blanco, Arillo-Santillan, Unger, & Thrasher, 2018). Allowing adolescents to take charge of their media environment may have potential for healthier dietary habits.

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Table 1

Intercorrelations among Major Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Household Possessions	1												
2. U.S. Media Enjoyment_Adolescent	.094	1											
3. U.S. Media Enjoyment_Mother	-.082	.114	1										
4. Media Literacy_Adolescent	-.058	.124	.247*	1									
5. Media Literacy_Mother	.056	-.100	.185	.361***	1								
6. Daily U.S. TV Hours_Adolescent	.220*	.294**	.060	0.145	-0.140	1							
7. Daily U.S. TV Hours_Mother	-.062	.139	.334**	0.109	-0.166	.408**	1						
8. Daily Jamaican TV Hours_Adolescent	-.329**	-.228*	-.259*	-.257*	-0.164	-0.127	-0.034	1					
9. Daily Jamaican TV Hours_Mother	-.350**	-0.108	-0.109	-0.021	-0.149	-0.162	0.075	.400***	1				
10. Reducing Sugar_Adolescent	-.036	-.099	.013	.128	.147	-0.097	-0.008	0.050	0.119	1			
11. Reducing Sugar_Mother	.164	-.027	.082	.156	.106	0.070	-0.063	-0.100	-.310**	.006	1		
12. Reducing Fat_Adolescent	-.011	-.156	-.023	-.006	.039	-.236*	-0.094	0.175	0.189	.497***	-.057	1	
13. Reducing Fat_Mother	.041	.121	-.183	-.066	.115	.226*	-0.042	0.075	-0.125	.143	.338**	.111	1

* $p < .05$. ** $p < .01$. *** $p < .001$

Table 2

Multilevel Models Predicting Reductions in Dietary Sugar and Fat with Media Literacy as a Moderator

Variable	Reducing Dietary Sugar		Reducing Dietary Fat	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Household Possessions	0.01	0.02	0.00	0.02
Adolescent Gender	-0.07	0.19	0.18	0.18
Person	0.42***	0.12	0.17	0.10
Own U.S. Media Enjoyment	0.04	0.11	-0.26**	0.09
Partner's U.S. Media Enjoyment	-0.03	0.09	0.07	0.08
Own Media Literacy	0.09	0.24	0.25	0.20
Partner's Media Literacy	0.27	0.27	-0.23	0.23
Own U.S. Media Enjoyment X Person	0.15	0.11	0.04	0.09
Partner's U.S. Media Enjoyment X Person	-0.02	0.09	0.10	0.08
Own Media Literacy X Person	-0.21	0.24	0.15	0.22
Partner's Media Literacy X Person	0.15	0.27	0.15	0.24
Own U.S. Media Enjoyment X Own Media Literacy	0.03	0.19	-0.02	0.17
Own U.S. Media Enjoyment X Partner's Media Literacy	0.12	0.24	0.48*	0.21
Own U.S. Media Enjoyment X Own Media Literacy X Person	-0.52**	0.20	0.07	0.17
Own U.S. Media Enjoyment X Partner's Media Literacy X Person	0.02	0.24	-0.31	0.21

Note: Person was effect coded: 1 = mother, -1 = adolescent; * $p < .05$. ** $p < .01$. *** $p < .001$

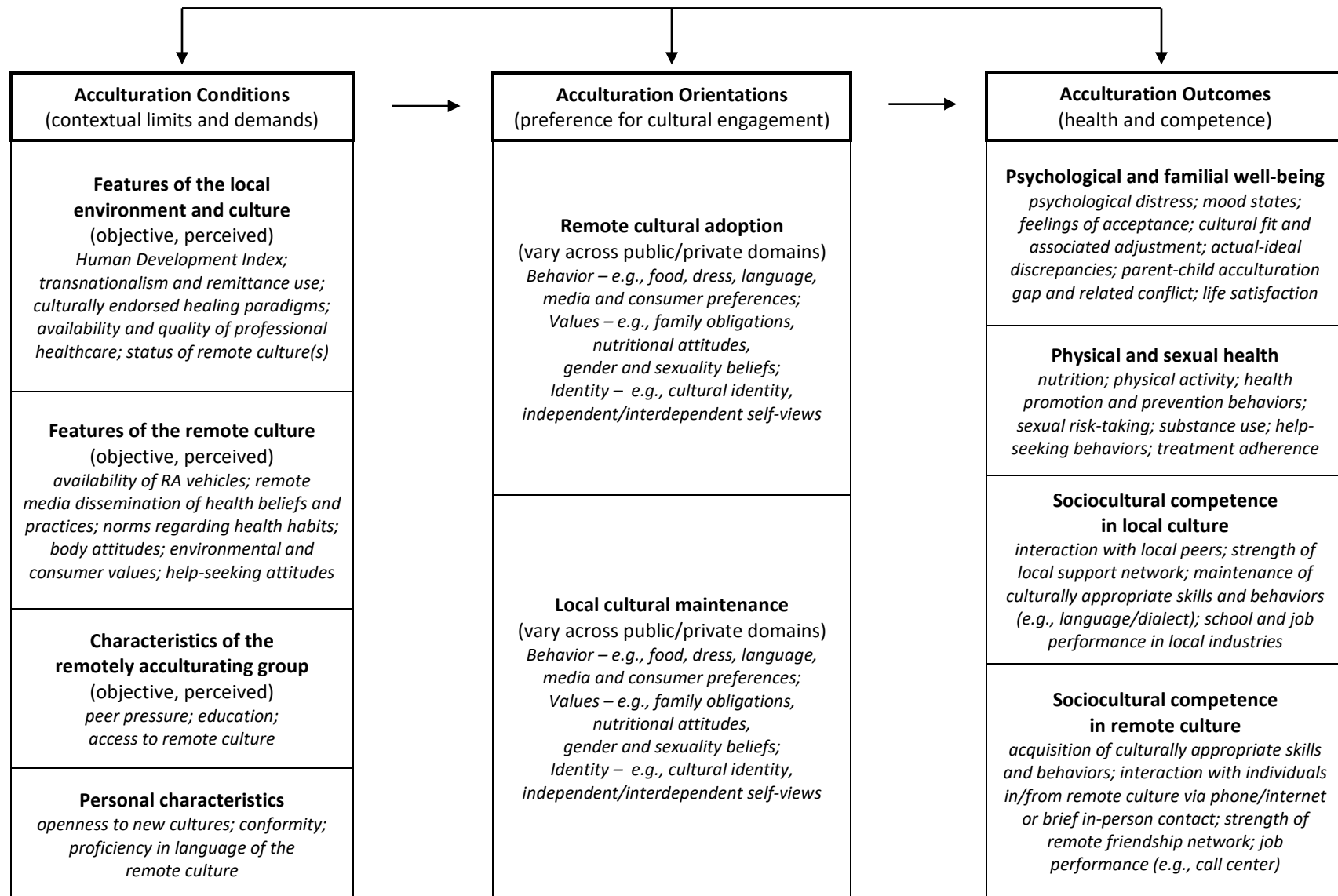
Table 3

Multilevel Models Predicting Reductions in Dietary Sugar and Fat with U.S. and Jamaican Media Use as Predictors

Variable	Reducing Dietary Sugar		Reducing Dietary Fat	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Household Possessions	0.01	0.02	0.00	0.02
Adolescent Gender	-0.05	0.19	0.25	0.17
Person	0.40***	0.09	0.39***	0.08
Own Daily U.S. TV Time	-0.11	0.10	-0.20*	0.08
Partner's Daily U.S. TV Time	-0.01	0.09	0.09	0.08
Own Daily Jamaican TV Time	-0.11	0.10	0.04	0.09
Partner's Daily Jamaican TV Time	0.05	0.10	0.10	0.09
Own Daily U.S. TV Time X Person	0.06	0.10	0.04	0.09
Partner's Daily U.S. TV Time X Person	0.02	0.10	0.14	0.09
Own Daily Jamaican TV Time X Person	-0.19	0.11	-0.13	0.09
Partner's Daily Jamaican TV Time X Person	-0.01	0.11	0.05	0.09
Own Daily U.S. TV Time X Own Daily Jamaican TV Time	-0.06	0.09	-0.04	0.08
Own Daily U.S. TV Time X Partner's Daily Jamaican TV Time	0.14	0.10	0.01	0.09
Own Daily U.S. TV Time X Own Daily Jamaican TV Time X Person	0.20*	0.09	0.24**	0.08
Own Daily U.S. TV Time X Partner's Daily Jamaican TV Time X Person	-0.08	0.10	-0.09	0.09

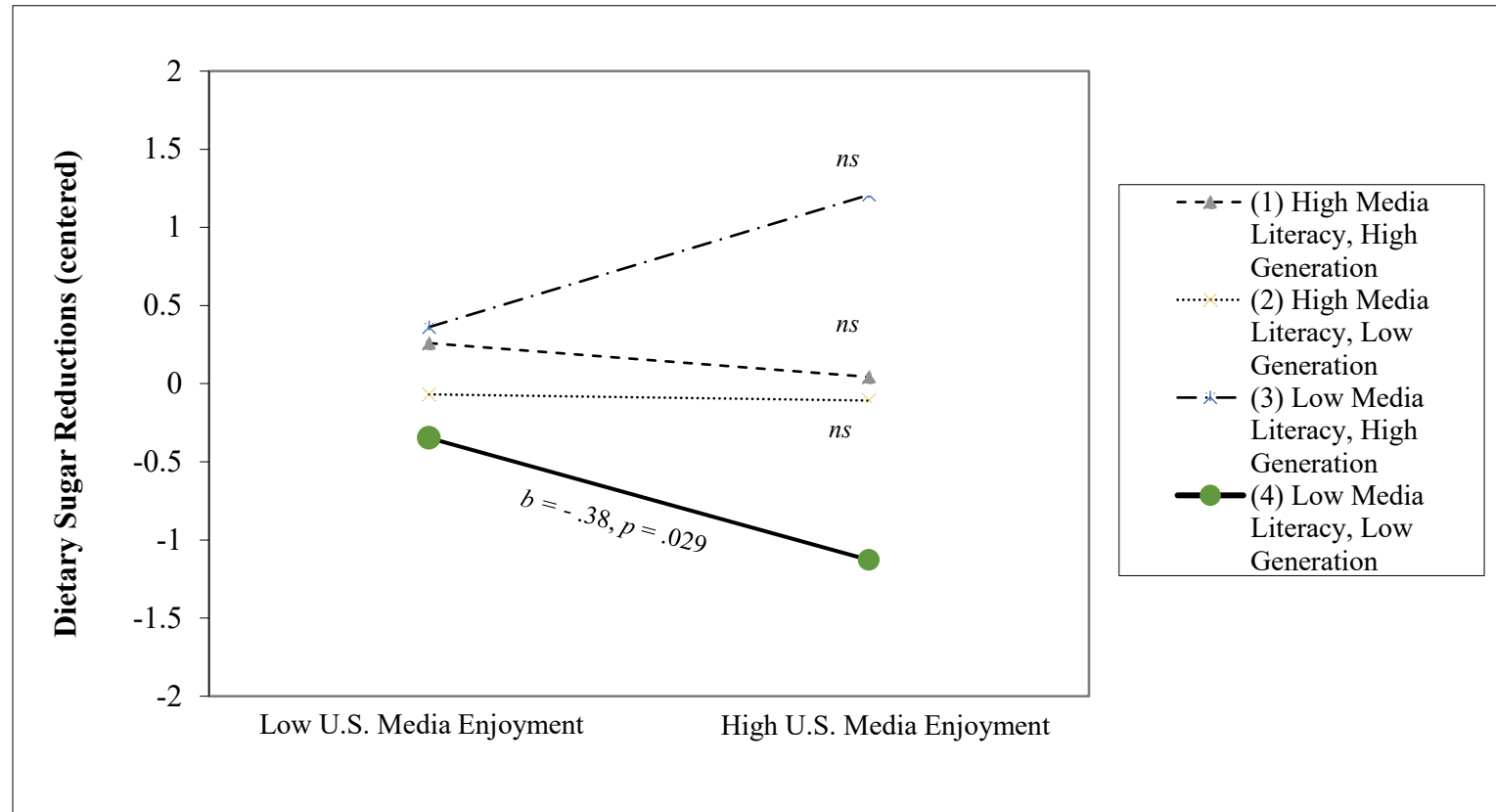
Note: Person was effect coded: 1 = mother, -1 = adolescent* $p < .05$. ** $p < .01$. *** $p < .001$

Figure 1. Framework of remote acculturation variables.



Note. Figure reprinted from Ferguson, Tran, Mendez, & van de Vijver (2017) with permission.

Figure 2. U.S. media enjoyment predicting dietary sugar reductions as moderated by media literacy and generation (i.e., adolescent vs. mother)



Note. Low Generation = Adolescents, High Generation = Mothers

Figure 3. U.S. media enjoyment predicting dietary fat reductions as moderated by media literacy of one's mother/adolescent

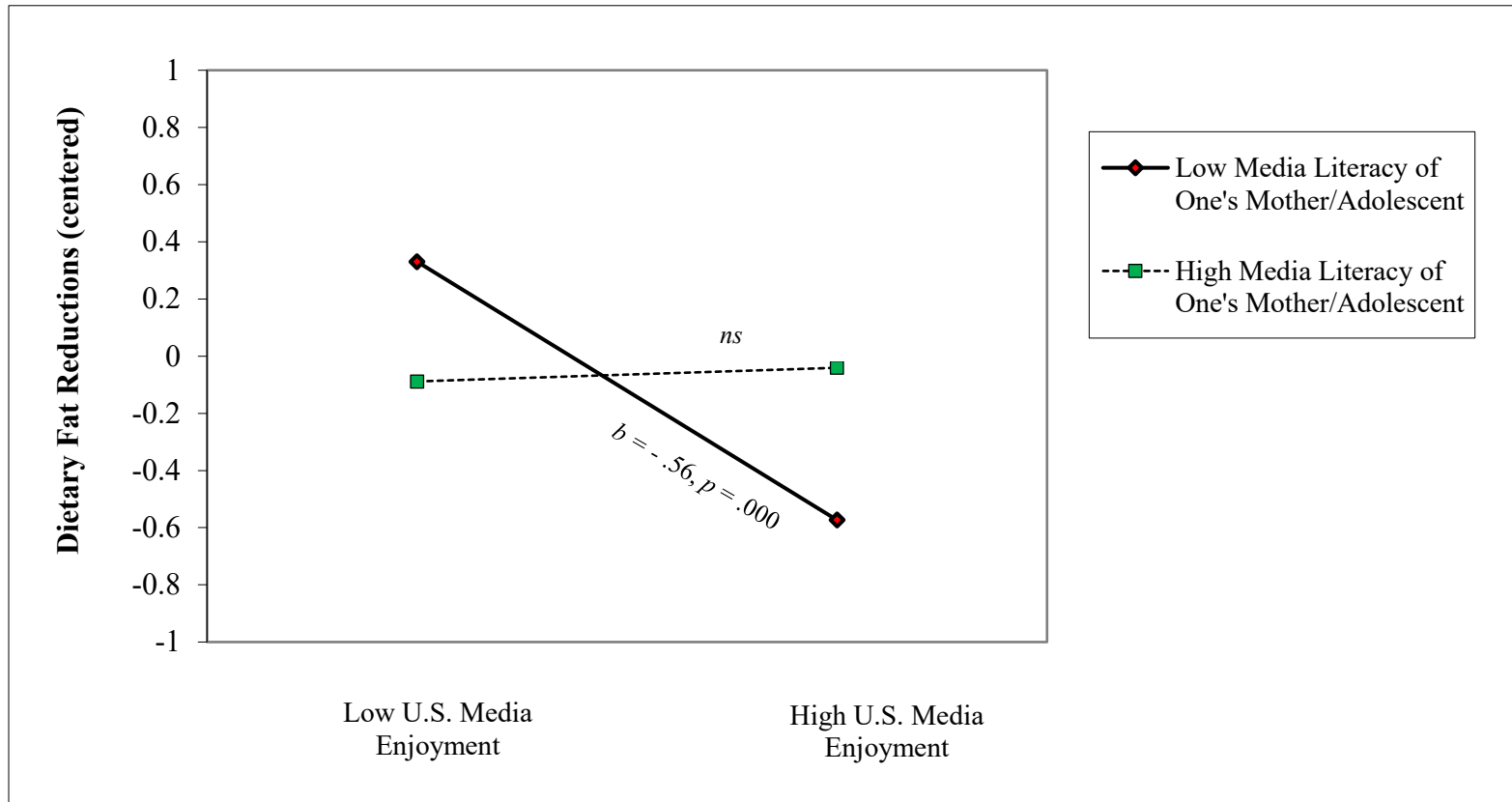
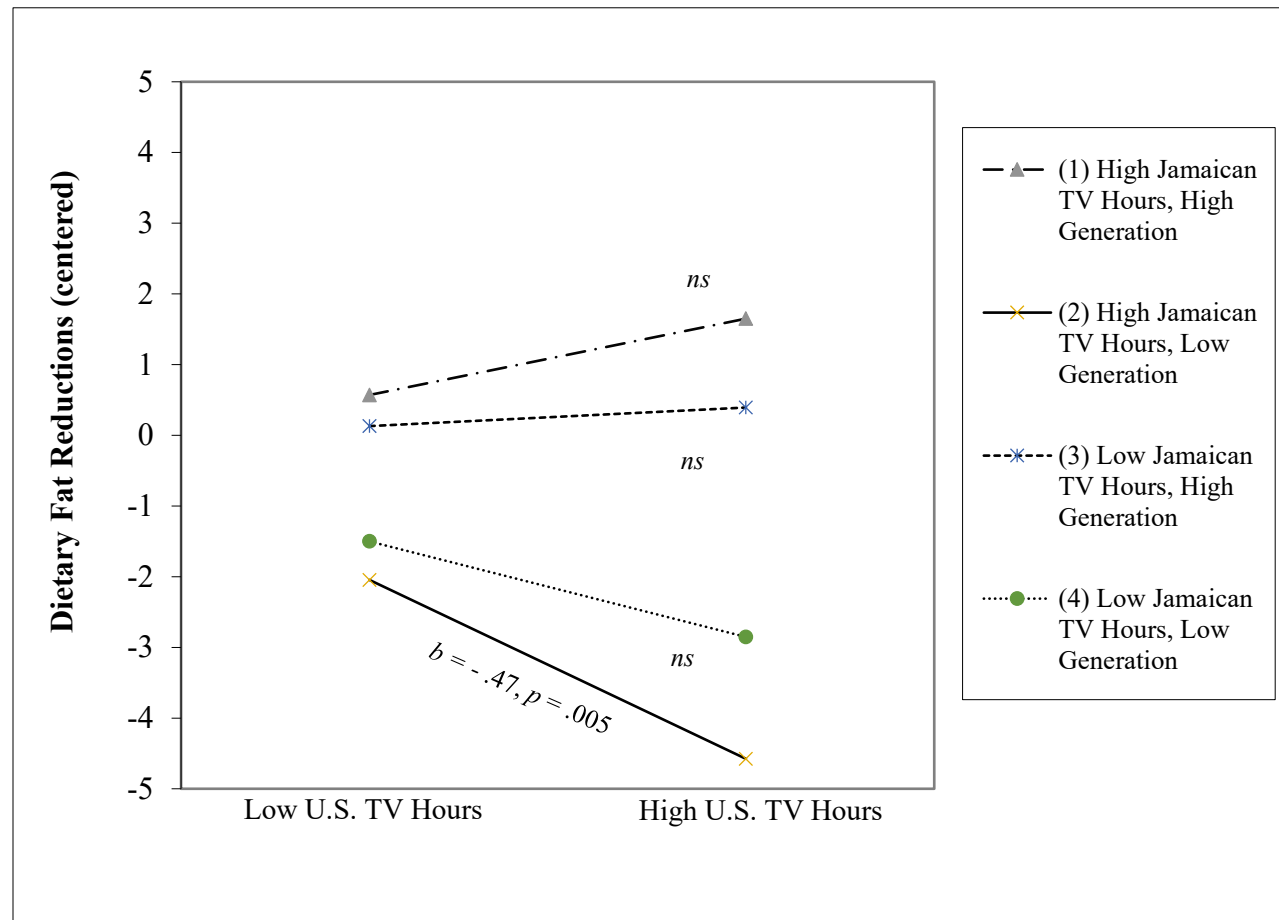


Figure 4. Daily U.S. TV hours predicting dietary fat reductions as moderated by Jamaican TV Hours and generation (i.e., adolescent vs. mother)



Note. Low Generation = Adolescents, High Generation = Mothers