Television exposure predicts body size ideals in rural Nicaragua

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Abstract

Internalisation of a thin ideal has been posited as a key risk factor in the development of pathological eating attitudes. Cross-culturally, studies have found a preference for heavier bodies in populations with reduced access to visual media compared to Western populations. As yet, however, there has been little attempt to control for confounding variables in order to isolate the effects of media exposure from other cultural and ecological factors. Here we examined preferences for female body size in relation to television consumption in Nicaraguan men and women, while controlling for the potential confounding effects of other aspects of Westernization and hunger. We included an urban sample, a sample from a village with established television access, and a sample from a nearby village with very limited television access. The highest BMI preferences were found in the village with least media access, while the lowest BMI preferences were found in the urban sample. Data from the rural sample with established television access were intermediate between the two. Amongst rural women in particular, greater television consumption was a stronger predictor of body weight preferences than acculturation, education, hunger, or income. We also found some evidence for television consumption increasing the likelihood of women seeking to lose weight, possibly via body shape preferences. Overall, these results strongly implicate television access in establishing risk factors for body image disturbances in populations newly gaining access to Western media.

Keywords: attraction, body weight preference, thin ideal, Nicaragua, television exposure

Introduction

Body dissatisfaction is widespread amongst girls and young women in western countries, where around 50% report being dissatisfied with their bodies (Bearman, Presnell & Martinez, 2006; Monteath & McCabe, 1997). Body dissatisfaction is a key predictor of the development of low self-esteem, depression, and eating disorders (Grabe, Hyde & Lindberg, 2007; Johnson & Wardle, 2005; Paxton, Neumark-Sztianer, & Hannan, 2006; Tiggemann, 2005). While individual genetic susceptibility and life event triggers are important factors in the development of eating and body image pathologies, awareness and internalisation of a thin-ideal has been identified as a key contributor to both poor body image and disordered eating amongst Western populations (see e.g. Levine & Murnen, 2009). Whilst the prevalence of obesity increases in Western countries, images of very slim, often underweight, women predominate in the visual diet (Cusumano & Thompson, 1997; Nemeroff, Stein, Diehl, & Smilack, 1994; Spitzer, Henderson, & Zivian, 1999; Wolf, 2002), exacerbating the large and potentially harmful discrepancy between women's ideals and their actual bodies (e.g., Levine & Harrison, 2004). Thus, one component in understanding the potential impacts of cultural factors on body dissatisfaction and its sequelae is to assess how attitudes to ideal body shape may be driven by visual media, in particular in this project, by television consumption.

Research into physical beauty ideals has found that it is possible to manipulate ideals by simple visual exposure to adjusted stimuli (faces: Rhodes et al, 2003; Bestelmeyer et al, 2008; bodies: Winkler & Rhodes, 2007; Boothroyd, Tovée & Pollet, 2012), by classical conditioning (Jones et al., 2007), by associating features with more abstract, desired traits (Boothroyd et al., 2012: aspirational vs neutral stimuli and body weight) and by the context in which they are seen (Bateson, Tovée, George, Gouws & Cornelissen, 2014). Given that Western media contains a rarefied selection of visual stimuli (i.e., the majority of actors, presenters, models, etc., tend to be unusually attractive and slim), and that thinness tends to be further positively valenced in the media (Tovée et al., 1997; Voracek & Fisher, 2002, 2006), both visual diet and valence effects could underlie media influence on general population preferences. Exposure to music videos and TV commercials which feature thin women in lead roles increases female viewers' dissatisfaction and eating disorder symptomology (Hargreaves & Tiggemann, 2003; Tiggemann & Slater, 2004), suggesting that even women who are familiar with western media can still show negative effects upon additional exposure.

Samples in the developing world tend to show preferences for heavier women than samples in the West (e.g. Anderson et al., 1992; Brown & Konner, 1987; Ember et al., 2005; Swami & Tovée, 2005, 2007; Swami et al., 2010), but exposure to Western media may be associated with a thinner body ideal. For example, Zulu migrants to the UK show preferences for body shape and body size which are more concordant with native Caucasian and Afro-Caribbean Britons than with Zulus remaining in South Africa (Tovée et al., 2006), although Zulu migrants still preferred larger bodies than the native British population. The authors suggested that while in South Africa a low body mass index (BMI) is a cue to poor health (indicative of diseases inducing wasting; Mvo et al., 1999; Clark et al., 1999; Cohan 1994; Kotler & Grunfeld, 1995) and poverty (McGarvey, 1991), migrants to the UK are exposed to a culture in which high BMI is deemed to indicate poor health, and low weight is associated with high socioeconomic status (Darmon et al., 2002; James et al., 1997) and is promoted in the media. Thus, migrants may adapt their beauty ideals to the new cultural input. One caveat regarding the Zulu data, however, is that the act of migration itself may contribute to changing preferences or body image, for instance via stress, loss of social support, and cultural identity conflicts. Further, availability and variety of food in the local environment may be greater in the UK than in Kwa-Zulu Natal, where there have been periodic food shortages (South African Department of Health, 1998). This latter point is important as there is evidence

that levels of hunger can affect body size preferences in Western samples (Swami & Tovée, 2006, Swami, Poulogianni & Furnham, 2007; see also Swami & Tovée, 2007).

What is required, therefore, is to examine the potential impact of media on body size ideals in a static population with varying levels of media exposure and without major gradients in nutritional resources. Swami et al. (2010) conducted a large cross-cultural survey on body preferences and included samples from two countries with significant variation in Westernisation and development; rural, low socioeconomic status (SES) individuals in both South Africa and Malaysia preferred larger bodies (and experienced lower body dissatisfaction) than their counterparts in Cape Town and Kuala Lumpur, respectively. Moreover, across the entire international sample, Western media exposure significantly predicted both ideal body size and body dissatisfaction in women, alongside own BMI (and age for ideal body size). Their two non-Western, rural samples, however, differed in many respects from their urban counterparts, with potentially confounding variables including income, education, socioeconomic status, and food availability; indeed the South African data were, as in Tovée et al (2006), drawn from Kwa-Zulu Natal. This is further highlighted by the fact that they found no effect of SES group on body preferences or satisfaction in Austria, where variation in food security, absolute levels of poverty and education are considerably less pronounced than in South Africa and Malaysia (e.g., Gini indices of income inequality show Austria to be least unequal at 26.0, followed by Malaysia at 46.2, and South Africa at 65.0). In the current study we considered groups of individuals with differing levels of access to Western media within a low SES, rural community. In doing so we were able to minimize variance in potential confounding factors and focus in particular on the potential influence of visual media. Furthermore, while Swami et al. (2010) used a relatively simple figure choice scale, likely for reasons of practicality, we used a preference task which allowed assessment not only of a single 'ideal' body size, but also more fine grained information about how participants viewed bodies across the full range of BMI. This allowed the shape of the BMI preference function to be measured. For example, in the Zulu study, there was a small shift in the preferred ideal BMI, but the most striking change between the groups was the change in the ratings of the overweight and obese bodies, which would not have been evident from simple ideal BMI values (Tovée et al., 2006).

The current study was conducted on the remote Mosquito Coast of Nicaragua, in two villages of the Pearl Lagoon Basin called Kakabila and Square Point (San Vicente). These two villages were selected because their inhabitants have differing access to electricity and to the media while at the same time sharing similar environmental and cultural constraints. Electricity was introduced in Kakabila in November 2008, and most households in the village have access to a television (their own or a friend's) and watch it daily; some also have a DVD player. In contrast, Square Point has no electricity and therefore no direct access to television. Furthermore, although both communities have some access to radio, there are no magazines and as such television remains a clear index of total exposure to Westernised visual media. All participants were asked during data collection what they watch on TV and those who have access to television report watching a mix of Latin American *telenovelas* (TV series and soaps which show a firm bias towards slim figures, e.g. Rivero, 2010; Giraldo, 2014) and imported U.S. films (with a preference for Hollywood action movies); other popular programs include local and international news, sports (especially live American baseball), cartoons, wildlife documentaries, and some music TV.

The economy of both Kakabila and Square Point is based on farming and fishing in the Pearl Lagoon Basin (see Jamieson, 2003). The people of Kakabila define themselves as predominantly Miskitu and the people of Square Point as predominantly Garifuna (in the core community) or Mestizo (in the peripheral farmsteads), but many of them are of mixed ethnic background, and virtually all of them can speak Creole English as a first or second language. Demographics for the sample used are provided below. Additional

data were collected in the capital, Managua, to compare the participants of Kakabila and Square Point with urban, fully acculturated Nicaraguan participants.

We used these villages to test the hypothesis that even controlling for potential confounds, television consumption would drive a preference for thinner female bodies. Identical data were gathered from both men and women in each of the three locations to allow comparison across high-media urban, high-media rural, and low-media rural groups, with the prediction that high media locations would show preferences for thinner bodies than the low media location. We then sought to identify in regression analyses whether television consumption was a significant linear predictor of body shape preferences while controlling for other variables. These analyses were conducted both across all participants, and then separately for the rural female samples, in order to assess the potential risks of television consumption for women to whom television represents a relatively novel source of cultural information and who may be particularly at risk of psychological impacts as a result (see e.g. Becker et al., 2002).

Method

Participants

One hundred and fifty-one participants were recruited in Kakabila (n = 66), Managua (n = 41), and Square Point (n = 44) using opportunity sampling. Fifty percent (n = 76) of the participants were female, and the mean age of the participants was 27.10 years (SD = 12.12, range: 15-77). The participants identified themselves as either Mestizo (34%, n = 52), Miskitu (33%, n = 50), Garifuna (14%, n = 21), or Mixed/Other (19%, n = 28). Participants' first languages were Creole English (42%, n = 63), Spanish (37%, n = 56), or Miskitu (21%, n = 32).

Materials and measures

Acculturation. Participants completed a questionnaire adapted from the Suinn-Lew Self-Identity Acculturation Scale (Suinn et al., 1987, 1992) and the original version for Hispanics (Cuellar, Harris, & Jasso, 1980), in which they reported the frequency with which they spoke or thought in US English or Spanish, and the proportion of their friends who were primarily Spanish or US English speaking versus Miskitu or Creole. Because participants consumed a mixture of English-language and Spanish television and film, and those in the Pearl Lagoon Basin have opportunities to engage with English-language tourists while working on cruise ships, it was felt important to include both languages as the 'acculturated' category.

Education. Participants indicated their highest level of education and total years of education. Fifty-eight percent (n = 87) of the participants reported that they had completed primary and at least some secondary education at local schools, and the average number of years of education by participant was 8.44 (SD = 4.07; range: 0-17).

Income. Participants reported their cash earnings in the last year in Nicaraguan Cordobas or US Dollars. For analysis, all earnings were converted into US Dollars. Although those in the Pearl Lagoon Basin villages in particular subsist in large part on their own crops and fishing, monetary income was still considered valuable as an index of engagement with the cash economy. Average income was equivalent to $814.57 ($SD$ = 3282.15; range: 0-36000).

Hunger. Participants reported their subjective level of hunger on a Likert scale from 1 (starving) to 10 (bursting), and the time in hours since their last meal. Very few participants reported hunger levels outside the range of 4-6 in any environment; as such this variable was not considered further and time since last meal was the focus of our analyses. The average number of hours since the participants' last meal was 3.44 (SD = 2.65; range: 0.25-20).

Television exposure. Participants reported whether they had television in their village (in their own home, in a friend's home they visit, in a house they don't visit, or no TV in village) and how many hours of television they had watched in the last 7 days. 73 % (n = 111) of the participants had a television in their house or in a neighbour's house that they visit regularly (with the remaining participants having no television in their village); no participants indicated that there was a television to which they had no access in the community (i.e., where there might have been social learning of norms without direct exposure to television). For this reason the amount of television directly consumed was the focus for analyses. The participants reported watching television for an average of 12.37 hours (SD = 11.66; range: 0-56) in the last 7 days before taking part in the experiment.

'Dieting'. Participants reported whether they were currently trying to lose weight (6 men, 24 women), trying to gain weight or muscle (32 men, 4 women), or were not trying to change their weight (37 men, 48 women). Data were recoded to indicate whether the participants were trying to lose weight or not.

Body weight preference task. Participants were shown a set of 50 colour photographs of women of known BMI, in front view, that have been used in previous published research (Tovée, Maisey, Emery, & Cornelissen, 1999; Tovée, Reinhardt, Emery, & Cornelissen, 1998), with ten women representing each of five body-mass index (BMI) categories: < 15 kg/m^2, 15-19 kg/m^2, 20-24 kg/m^2, 25-30 kg/m^2, and > 30 kg/m^2. Participants rated each body for how "attractive" they thought they were (in the Spanish version, "*atractivo*"), on a scale ranging from 1 (*very unattractive*/*muy poco atractivo*) to 5 (*very attractive*/*muy atractivo*). Images were presented in a random order on a laptop screen and participants verbally reported their preference rating, which the experimenter entered directly onto the laptop. Two scores were derived from these data. Firstly, peak BMI preference was calculated for each participant by fitting a cubic regression function onto their preference ratings and the BMI of each image; peak BMI presents the BMI value predicted by the apex in the function. Secondly, in order to quantify information about the shape of the regression functions, we also calculated the linear gradient of preferences from peak BMI to peak+10; for instance if the participant's peak BMI preference was 20.3, we calculated the predicted strength of preference for BMI 20.3 and BMI 30.3 and then calculated gradient of the decline in strength of preference over that span. The sharper the fall in preferences with higher BMIs, the more negative the gradient. This method was chosen because initial inspection of data suggested that some groups utilized higher ratings of the bodies across the board (see Figure 1) and so simply, say, predicting strength of preference at BMI 30 would have been uninformative. 7 participants were discarded during data processing because their data did not produce a viable regression function.

Procedure

Participants were tested individually in a quiet room with a desk in Kakabila, Managua, or Square Point. They were told that they would be asked questions about "electricity and television" and that they would be shown images of women's bodies, which they would need to rate for attractiveness. They were also told that we were interested in their personal opinion and that there were no "right or wrong" answers for this study. The questionnaire measures were administered verbally to all participants regardless of literacy levels and the experimenter entered responses on a laptop computer. The participants then completed the bodies test. As most participants were not familiar with Likert scales, target question and scale were repeated for each figure, and the experimenter would check that the participants used the scale accordingly (for example, the experimenter would ask after the first few trials, "You gave a 3 to the previous body, and a 4 to the current body. So this means that you find the current body a bit more attractive than the previous body, correct?") Testing ceased in one case were it was evident the participant did not understand the measure after 5 trials. Testing sessions typically lasted between 30 and 40 minutes and each participant was paid C$100 (approximately $4) for their time. Sixty-four percent (n = 97) of the participants were interviewed and took the test in Creole English, and 36% (n = 54) in Spanish.

Results

Predictors of BMI preferences

Comparison between samples

ANCOVA was used to assess the difference in peak BMI preferences and preference gradient between residents of Kakabila, Managua and Square Point. Location and sex of participant were entered as between subjects variables; age was entered as a covariate. There was a significant association between age and BMI preference such that older individuals preferred larger bodies ($F_{1,137} = 8.36$, $p < .01$, $\eta_p^2 = .06$) but no relationship between age and preference gradient ($F_{1,137137} = 1.959$, $p = .16$, $\eta_p^2 = .01$). There was a significant association between location and both peak BMI preference ($F_{2,137} = 17.26$, $p < .001$, $\eta_p^2 = .20$) and preference gradient ($F_{2,137} = 10.54$, $p < .001$, $\eta_p^2 = .13$). Post-hoc tests showed that residents of Managua had a significantly lower peak BMI preference than residents of Kakabila, who in turn had a significantly lower peak BMI preference than residents of Square Point (22.78, 25.30 and 27.98, respectively); residents of Square point had a less negative preference gradient after the peak than residents of other locations (who did not differ from each other; Square Point: -.04, Kakabila: -.15, Managua: -.14). Preference functions using mean scores from each location are shown in Figure 1. There was no main effect of sex of participant for either preference variable, and no interaction between sex and location for peak BMI preference (Fs < 1.9, ps > .216, η_p^2 <.03). There was however a significant interaction between sex and location for preference gradient ($F_{2,137} = 5.31$, $p < .01$, $\eta_p^2 = .07$). Independent t-tests performed separately in each location showed that the preferences of males tended to decline more sharply than that of females in Square Point (means: males -.10, females .01, $t_{38} = 1.93$, $p = .06$), while the opposite pattern was present in Managua (means: males -.11, females -.16, $t_{38} = 2.41$, $p = .02$; there was no significant difference in Kakabila (means: males -.14, females -.15, $t_{63} = .68$, $p = .50$.

Comparisons between locations on our predictor variables showed that residents of Managua were significantly more educated ($F_{2,139} = 26.81$, $p < .001$, $\eta_p^2 = .28$; post hoc $p = .01$) and watched more television ($F_{2,139} = 106.16$, $p < .001$, $\eta_p^2 = .60$; post hoc $p = .01$) than residents of Kakabila, who in turn were more educated (post hoc $p < .001$) and watched more television (post hoc $p < .001$) than residents of Square Point. Residents of Managua were also the most acculturated ($F_{2,139} = 164.71$, $p < .001$, $\eta_p^2 = .70$; post hoc ps < .001), followed by residents of Square Point who were more acculturated than residents of Kakabila (post hoc $p < .001$). Residents of both Managua and Kakabila had eaten more recently than residents of Square Point ($F_{2,139} = 5.00$, $p < .01$, $\eta_p^2 = .07$; post hoc ps < .05) but did not differ from each other (post hoc $p = .31$). Finally, residents of Managua earned more money in the previous year than residents of either village ($F_{2,139} = 4.00$, $p = .02$, $\eta_p^2 = .05$, post hoc ps < .05) who did not differ from each other ($p = .981$). There was no difference between locations in terms of subjective rated hunger ($F_{2,139} = 0.10$, $p = .99$, $\eta_p^2 = .00$) or age ($F_{2,139} = 2.24$, $p = .11$, $\eta_p^2 = .03$) . Means are shown in Table 1. There were no sex differences or interactions for any variable (Fs < 2.8, ps > .1) except for a borderline main effect of sex on acculturation ($F_{1,139} = 2.86$, $p = .09$, $\eta_p^2 = .02$) and a borderline interaction between sex and location for TV consumption ($F_{2,139} = 2.42$, $p = .09$, $\eta_p^2 = .03$).

Comparisons across individuals

Correlations between our predictor and outcome variables are shown in Table 2. Income showed no zero-order relationship with either measure of body preferences and so was not considered further as a potential predictor. Hierarchical regression models were then used to examine the relative relationships between our remaining predictor variables and first peak BMI preference, then preference gradient, across individuals. Coefficients for all models discussed here are shown in Table 3; across all models

multicollinearity diagnostics were satisfactory (tolerances over .5). Age, acculturation, years of education, and time since last meal, were entered as predictors in the first model and television consumption was then entered in the second model. In every instance, addition of TV consumption improved the model (*p*s < .05; except peak BMI preferences across all participants where $p = .06$). When all participants were analysed together, all variables except education were significant or marginal predictors of peak BMI preference in the final model such that a preference for thinner bodies was associated with greater acculturation, more TV consumption, less time since last meal, and marginally, greater age. In contrast, for BMI preference gradient, only TV consumption was a significant predictor, such that more TV consumption was associated with a steeper decline in preferences for larger bodies.

Further analysis of our group of particular interest, the rural women, found that only TV consumption had a significant relationship with either peak BMI preference or preference gradient, such that those who watched more television preferred thinner figures with a steeper decline in preferences after that point. There was also a marginal association between Education and preference gradient, such that more education predicted a reduced preference for large bodies.

Predictors of dieting

Comparison between samples

2x3 chi square analyses were conducted separately for each gender to investigate the relationship between location and dieting. There was no significant association between location and likelihood of dieting for men ($\chi^2 = 2.12$, df = 2, $p = .35$) but there was a significant association for women ($\chi^2 = 9.66$, df = 2, $p = .01$). Further examination revealed that residents of Managua were significantly more likely to be dieting than residents of Square Point ($\chi^2 = 6.74$, df = 1, $p = .01$) and marginally more likely to be dieting than residents of Kakabila ($\chi^2 = 2.82$, df = 1, $p = .09$). There was no difference between the rates of dieting in the women of Kakabila versus Square Point ($\chi^2 = 2.14$, df = 2, $p = .14$).

Comparisons across individuals

Logistic regressions were conducted to investigate the linear predictors of dieting in women. Initially, the same predictors as in previous linear regressions were entered in a hierarchical model. Following this, TV consumption was added in a second model, and peak BMI preference and Preference gradient were added in a third model, in order to establish whether the relationship between the original predictors and dieting was mediated by BMI preferences. As can be seen in Table 4, across all the women in the sample, likelihood of dieting was initially predicted only by TV consumption. Once body shape preferences were added to the equation, TV consumption ceased to be a significant predictor, while peak BMI preference was a marginal predictor, suggesting that BMI preferences may mediate the effects of TV consumption. When the data were limited to the rural sample, TV consumption emerged as the only (marginal) predictor of likelihood of dieting in the original model, but again became nonsignificant once body shape preferences were added to the model, although in this instance body shape preferences were not significant predictors either (see Table 4).

Discussion

The primary purpose of the current study was to investigate whether television consumption predicted female body size preferences in rural Nicaragua. Peak BMI preference and preference gradient (the steepness of the decline in preferences for larger bodies) were compared across two villages with differing media access but with the same socio-economic and ecological conditions, and a fully urbanized sample from the capital, Managua. As hypothesized, initial comparisons found preferences for larger female bodies in areas with reduced access to/consumption of television, while people in the urbanized capital showed a strong preference for low BMI female bodies. When data were analyzed on the individual level, acculturation and time since last meal predicted peak BMI preferences independently of other variables across all participants, and could thus potentially contribute to the between location differences. Only television consumption, however, predicted peak BMI preferences *and* preference gradient in both the full sample, and in the narrower sample of rural women, who we predicted would be most at risk in terms of recent exposure to visual media. Across all models, participants who watched the most television showed the most 'Westernised' body preferences (a lower peak BMI preference with a steeper decline in preferences for larger bodies). Critically, this pattern cannot be explained by levels of acculturation, education, or even nutritional status.

Whether or not our participants reported that they were dieting was also associated with media exposure. Levels of dieting across locations mirrored overall BMI preferences and levels of TV consumption; a higher proportion of women were dieting in Managua than in Square Point, while Kakabila was intermediate between the two. TV consumption likewise predicted dieting in both the full sample and (marginally) rural women until BMI preferences were entered into the models, suggesting that TV consumption's effect on dieting may be mediated via BMI preference (although for the rural women, Model 3 was underpowered to detect effects amongst 7 predictors; N=55). Because we did not assess the women's actual BMI it is impossible to rule out that the relationship between TV and dieting could be mediated by sedentary TV consumption leading to weight gain, although the lack of interest in losing weight amongst our male participants might count against such an explanation. However, regardless of the mechanism, these data are suggestive that TV consumption represents a risk factor for body weight concerns.

We might therefore conclude that exposure to television exerts a particular influence over the types of bodies that rural Nicaraguan women consider attractive when considering their own gender and may increase their interest in losing weight themselves. Given the evidence that internalization of a thin ideal and holding a thinner 'ideal self' visual representation can contribute significantly to body dissatisfaction in Western samples, television may therefore represent a risk factor in the development of poor body esteem and its sequelae amongst newly exposed populations. Indeed, Swami et al. (2010) found a significant relationship between women's ideal body size and body dissatisfaction across their international sample. In this respect our data are also consistent with that of Becker et al., (2002) who observed that levels of body dissatisfaction and pathological eating attitudes increased in Fijian adolescents following the introduction of television (see also Becker, 2004). It is crucial to note that in Kakabila, daily television access for the majority of residents extends back only six years, and the people of Square Point, while they may have sporadic access to television while visiting other communities, have yet to experience Western media exposure on a regular basis. As such these data represent the potential effects of relatively early television exposure.

An important point for consideration is that although the preferences of our Managuan sample resembled those of Western participants in other studies, in terms of their peak BMI preferences this does not rule

out the possibility of other forms of variation in body shape preferences in Latin American samples. For instance, many male participants in our study reported a preference for very large buttocks and relatively small breasts during informal interviews (see likewise Overstreet et al, 2010, for a comparison of racial variation in body preferences in the West). Given that our stimuli consisted of White European women, who may have differing body shapes to Latin American women even at the same BMI, we should be likewise cautious about concluding that our data reflect the *specific* weight (or shape) participants believe ideal for women in their local group, although rank order differences across participants are likely unaffected.

An additional caveat in the current study is that our data are cross-sectional and we therefore cannot rule out the possibility that television habits are driven by body size preferences (or more likely some confounding variable). However, the fact that education, income, a measure of nutritional status - and perhaps most crucially, broader acculturation - cannot explain the relationship between television consumption and body size preferences, rules out the most likely candidates for alternative causation. Likewise, the fact that television access is outside the direct control of some of our participants renders reverse causation unlikely.

Related to this, it is important to note that we were unable in our dataset to statistically distinguish between individual and location-level variance in body size preferences. As we had selected our locations specifically to maximize variation in television access, multicollinearity prevented use of location as a dummy variable in our regression analyses and we did not have enough locations to conduct multilevel modelling. As such, there may be other location-level factors which supersede the individual predictors analysed here (or indeed these predictors may operate at multiple levels, for instance via social learning effects within communities.) It remains the case, however, that of those variables which differ across locations, television consumption is the only predictor to be significant in all models. We strongly recommend further replication of this study with a wider range of communities and/or using robust longitudinal methods. Indeed, only longitudinal pseudo-experimental data will enable us to say with certainty that television is the crucial factor in driving differences in body size preferences in the Pearl Lagoon Basin.

In summary, we have demonstrated that consumption of televisual media plays a significant role in shaping the attitudes to attractive female body size within an economically homogenous sample of rural Nicaraguan women and this may represent a risk factor for weight loss attempts. Further research will elaborate on this to establish whether these body ideals negatively affect psychological well-being, such as body esteem and eating attitudes.

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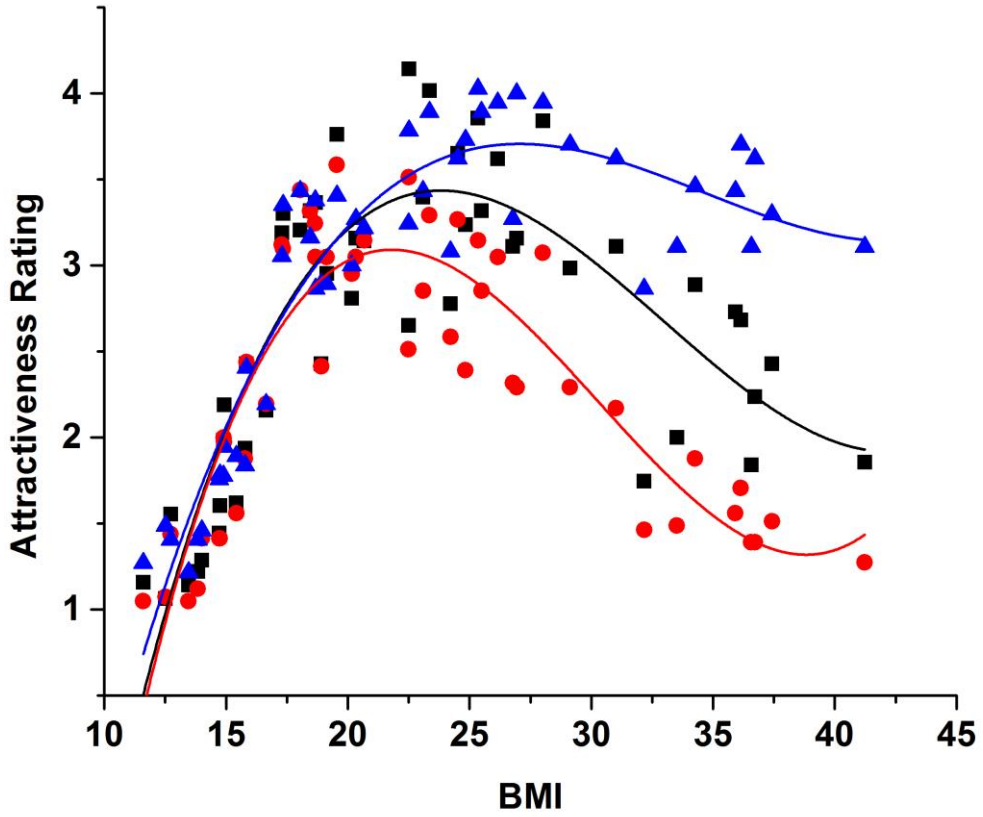

Figure 1. Cubic regression functions for the relationship between figure BMI and ratings of attractiveness from each location. Each point represents the mean rating by the participants in each participant group for each of the female bodies. The black squares and black line represent the Kakabila ratings, the red circles and red lines represent the Managua ratings and the blue triangles and line represent the Square Point ratings.

Table 1. Demographic characteristics of each location

	Managua	Kakabila	Square Point
Final N	40	65	40
% female	46.3	60.6	38.6
% Miskitu	0	74.2	2.3
% Mestizo	92.7	1.5	29.5
% Garifuna	0	0	47.7
Age	27.3 (1.92)	24.77 (1.54)	29.99 (1.95)
Acculturation	4.66 (0.13)	1.53 (0.11)	2.5 (0.14)
Education (years)	10.91 (0.57)	8.88 (0.46)	5.08 (0.58)
Income last year $	2025 (510)	389 (410)	226 (518)
Hunger	4.83 (0.14)	4.85 (0.11)	4.82 (0.14)
Hours since last meal	2.72 (0.36)	3.19 (0.29)	4.3 (0.37)
TV last week (hours)	21.38 (1.47)	13.3 (1.18)	1.52 (1.5)
Ln(TV consumption)	2.84 (0.13)	2.29 (0.1)	0.39 (0.13)
% dieting: men	13.6	4	4.2
women	55.6	30	6.3

Table 2. Inter correlations between all predictors and outcomes. Above the diagonal: full sample, N=144; below the diagonal: rural women, N=56.

	1	2	3	4	5	6	7	8	9
1. *Peak BMI preference*		.34** .00	.25** .00	-.29** .00	-.34** .00	-.03 .76	-.10 .25	.27** .00	-.34** .00
2. *Preference gradient*	.44** .00		.17* .04	-.010 .87	-.23** .01	-.01 .88	-.10 .25	.10 .21	-.29** .00
3. Age	.27* .05	.07 .59		.04 .65	-.4** .00	.14 .08	-.02 .78	.12 .15	-.23** .01
4. Acculturation	.01 .95	.17 .21	.07 .63		.10 .21	.15 .08	-.185* .03	-.04 .67	.15 .06
5. Education (years)	-.2* .05	-.34** .01	-.4** .00	-.4** .00		.09 .31	.13 .12	-.29** .00	.49** .00
6. Income last year $	.16 .23	-.14 .29	.3** .00	-.09 .52	-.29* .03		-.11 .19	.07 .43	.07 .40
7. Hunger	-.18 .18	-.2 .15	-.03 .85	-.34** .01	.21 .11	.11 .43		-.57** .00	.06 .50
8. Last meal?	.306* .02	.24 .08	.23 .09	.2 .14	-.38** .00	.08 .57	-.6** .00		-.23** .01
9. Ln(TV consumption	-.33* .01	-.4** .00	-.23 .09	-.47** .00	.42** .00	.06 .64	.08 .57	-.270* .04	

Table 3. Regression analysis of predictors of peak BMI preference

			B (*95% CI*)	*β*	*t*	*p*
All participants	*Peak BMI preference*					
	First model[1]	Age	.03 (.00, .12)	.16	1.95	.05
		Acculturation	.21 (-1.20, -.36)	-.27	-3.64	.00
		Education (years)	.09 (-.39, -.03)	-.20	-2.33	.02
		Last meal (hours)	.15 (.03, .62)	.17	2.20	.03
	Second model[2]	Age	.03 (.00, .12)	.15	1.86	.06
		Acculturation	.21 (-1.15, -.31)	-.25	-3.4	.00
		Education (years)	.10 (-.33, .06)	-.12	-1.34	.18
		Last meal (hours)	.15 (.01, .59)	.16	2.04	.04
		Ln(TV consumption)	.30 (-1.19, .01)	-.17	-1.96	.05
	Preference gradient					
	First model[3]	Age	.00 (.00, .00)	.09	1.01	.31
		Acculturation	.01 (-.01, .01)	.00	0.05	.96
		Education (years)	.00 (-.01, .00)	-.18	-1.94	.05
		Last meal (hours)	.00 (-.01, .01)	.04	0.48	.63
	Second model[4]	Age	.00 (.00, .00)	.08	0.93	.35
		Acculturation	.01 (-.01, .01)	.03	0.35	.73
		Education (years)	.00 (-.01, .00)	-.08	-0.81	.42
		Last meal (hours)	.00 (-.01, .01)	.02	0.23	.81
		Ln(TV consumption)	.01 (-.04, .00)	-.23	-2.46	.02
Female villagers	*Peak BMI preference*					
	First model[5]	Age	.07 (-.08, .22)	.14	0.97	.34
		Acculturation	.65 (-1.86, .74)	-.13	-0.86	.39
		Education (years)	.20 (-.60, .20)	-.17	-0.99	.33
		Last meal (hours)	.33 (-.11, 1.21)	.23	1.67	.1
	Second model[6]	Age	.07 (-.09, .20)	.11	0.75	.45
		Acculturation	.67 (-2.39, .29)	-.24	-1.57	.12
		Education (years)	.19 (-.53, .25)	-.12	-0.72	.47
		Last meal (hours)	.32 (-.18, 1.11)	.2	1.46	.15
		Ln(TV consumption)	.58 (-2.4, -.06)	-.31	-2.11	.04
	Preference gradient					
	First model[7]	Age	.00 (-.01, .00)	-.11	-0.77	.44
		Acculturation	.02 (-.05, .04)	-.02	-0.11	.91
		Education (years)	.01 (-.03, .00)	-.35	-2.02	.05
		Last meal (hours)	.01 (-.01, .03)	.13	0.95	.35
	Second model[8]	Age	.00 (-.01, .00)	-.16	-1.15	.26
		Acculturation	.02 (-.07, .02)	-.17	-1.12	.27
		Education (years)	.01 (-.02, .00)	-.29	-1.74	.09
		Last meal (hours)	.01 (-.01, .03)	.09	0.66	.51
		Ln(TV consumption)	.02 (-.09, -.02)	-.42	-2.90	.01

1. R2= 0.23, F[4,139]=10.59 p<.001; 2. R2= 0.25, F[5,138]=9.41 p<.001, change in R2 p =.06;
3. R2 = 0.06, F[4,139]=2.17 p=0.08; 4. R2 = 0.10, F[5,138]=3.07 p=0.01, change in R2 p <.05;
5. R2 = 0.15, F[4,51]=2.31 p=0.07 ; 6. R2 = 0.22, F[5,50]=2.87 p=0.02, change in R2 p <.05;
7. R2 = 0.14, F[4,51]=2.10 p=0.09; 8. R2 = 0.27, F[5,50]=3.61 p=0.01, change in R2 p <.05.

Table 4. Logistic regressions for predictors of likelihood of dieting amongst female participants.

			df	*p*	*Exp(B)*	*95% CI*
All females	Model 1[1]	Age	1	.15	1.27	0.92-1.74
		Total years education	1	.14	1.04	0.99-1.1
		Hours since last meal	1	.36	1.07	0.93-1.23
		Acculturation	1	.84	1.02	0.82-1.28
	Model 2[2]	Age	1	.18	1.26	0.9-1.76
		Acculturation	1	.12	1.05	0.99-1.12
		Education (years)	1	.87	0.99	0.83-1.17
		Last meal (hours)	1	.76	1.04	0.82-1.31
		Ln(TV consumption)	1	.03	1.86	1.06-3.28
	Model 3[3]	Age	1	.41	1.17	0.81-1.69
		Acculturation	1	.03	1.08	1.01-1.16
		Education (years)	1	.80	0.98	0.83-1.15
		Last meal (hours)	1	.30	1.15	0.88-1.49
		Ln(TV consumption)	1	.11	1.60	0.9-2.84
		Peak BMI preference	1	.06	0.84	0.7-1.01
		Preference gradient	1	.22	0.01	0-12.51
Female villagers	Model 1[4]	Age	1	.55	0.79	0.36-1.71
		Total years education	1	.28	1.04	0.97-1.13
		Hours since last meal	1	.98	1.00	0.82-1.22
		Acculturation	1	.35	0.84	0.59-1.2
	Model 2[5]	Age	1	.96	0.98	0.4-2.39
		Acculturation	1	.21	1.05	0.97-1.15
		Education (years)	1	.78	0.97	0.78-1.21
		Last meal (hours)	1	.51	0.88	0.61-1.28
		Ln(TV consumption)	1	.09	1.86	0.91-3.82
	Model 3[6]	Age	1	.88	0.93	0.37-2.35
		Acculturation	1	.15	1.07	0.98-1.17
		Education (years)	1	.76	0.97	0.78-1.2
		Last meal (hours)	1	.66	0.92	0.63-1.34
		Ln(TV consumption)	1	.21	1.67	0.75-3.7
		Peak BMI preference	1	.22	0.89	0.75-1.07
		Preference gradient	1	.95	0.80	0-690.16

1. Nagelkerke R^2 = .09; 2. Nagelkerke R^2 = .19; 3. Nagelkerke R^2 = .29; 4. Nagelkerke R^2 = .07; 5. Nagelkerke R^2 = .17; 6. Nagelkerke R^2 = .20