

Briefing Paper- Quantifying the effect of characters and celebrities in food marketing on dietary outcomes in children

Authors

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Response mode study

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Executive summary

Question

What is the impact of using characters and celebrities in high fat, salt and sugar (HFSS) adverts and packaging on children's food preferences, purchasing behaviours and consumption?

Methods

Two systematic reviews with meta-analyses

Findings

- Packaging for HFSS foods with characters significantly increased taste preference for HFSS products compared to HFSS adverts without characters
- HFSS adverts with celebrities significantly increased HFSS consumption in children compared to adverts for non-food products
- There was no evidence of any difference between licensed (borrowed equities) or equity brand characters (created by the company) in taste preference

Policy relevance

Current restrictions treat licensed characters and celebrities popular with children differently to brand equity characters, which are exempt from any restrictions. There is no justification for this based on the evidence from our reviews. There are no relevant restrictions on packaging.

Summary

In this briefing paper we present the results of two response mode reviews undertaken by OPRU. The review process was completed separately for both reviews, but the results are presented together due to the policy overlap and relevance.

Background

Children in the UK are exposed to a myriad of adverts, many for HFSS products, some of which are targeted directly at children.^{1 2 3 4} Advertising is known to be effective, increasing consumption, preference and purchase intention of HFSS products following exposure.^{5 6 7} The impact on consumption is of concern, as evidence shows that even a small excess in daily calories can contribute to overweight and obesity.⁸ Rates of childhood obesity in the UK are currently 1 in 10 at ages 5-6 years, increasing to 1 in 5 at ages 10-11 years.⁹ Childhood obesity tracks through adolescence and into adulthood, and is known to increase the risk of many physical health conditions and also negatively impact on psychosocial health and wellbeing.^{10 11 12 13}

In 2010, the WHO made recommendations for the marketing of foods and non-alcoholic beverages to children (the term 'marketing' includes both advertising and packaging), stating the overall policy objective should be the reduction of exposure to and power of HFSS marketing.¹⁴ In the accompanying framework for implementation a specific example given for 'reducing power' was the introduction of restrictions on the use of equity brand characters, licensed characters and celebrities.¹⁵ The UK government is committed to increasing restrictions around advertising for HFSS products, as outlined in the Childhood Obesity Strategy 2016-2019 (including COP1, COP2 and the Prevention Green Paper 'Advancing Our Health: Prevention in the 2020s').¹⁶ Following a report from Public Health England (PHE), the House of Commons Health Committee on Childhood Obesity passed on recommendations for the tightening of controls of advertising and marketing to children, specifically 'plugging the loopholes'.^{17 18} These 'loopholes' are the current unrestricted use of non-licensed characters and most celebrities (as there is no clear definition).

In 2007 in the UK, restrictions on advertising HFSS products were introduced, with the aim of limiting exposure to children (defined as persons below the age of 16).¹⁹ These restrictions banned HFSS adverts on or around broadcast children's programmes, such as children's TV channels or before/during/after children's programmes.²⁰ They also restricted the use of licensed characters and celebrities popular with children in HFSS adverts targeted directly at pre or primary school children. Equity brand characters (puppets, persons or characters) are specifically exempt, stating that they 'may be used by advertisers to sell the products they were designed to sell'.²⁴ Following evidence that the restrictions were not working as intended,²¹ and a public consultation,²² the restrictions were expanded in 2017.²³ The restrictions were extended to cover non-broadcast media, specifically print, cinema, online and social media, when the audience is greater than 25% children (see codes 13.10, 13.14 and 32.5.1 BCAP²⁴ and 15.15 CAP²⁵ for current restrictions). Of note, this does not cover packaging and there are no other restrictions around the use of characters and celebrities on packaging under current UK food labelling restrictions.²⁶ Examples of the different character types and use of characters and celebrities used in advertising and packaging are presented in [Figure 1](#).

Figure 1. Advertising Standards Authority definitions and examples of characters and celebrities used in HFSS marketing

Equity brand characters

- Created by the advertiser and have no separate identity outside their associated product or brand. Also referred to as brand mascots. Examples: Coco the Monkey, Tony the Tiger, Chester Cheetah, Julius Pringle, M&M characters



Licensed characters

- Borrowed equities and have no historical association with the product. Examples: Peppa Pig, Dora the Explorer, Sesame Street, Disney and Pixar characters



- Examples of use on product packaging:



Celebrities popular with children

- No definition provided by ASA. Examples of celebrity endorsements:



Content analyses of marketing practices reveal that in both the UK and US, the majority of food and drink products using characters on their packaging were for HFSS products.^{27 28} An international analysis of child-targeted TV food advertising found that, on average, one quarter contained characters (up to 49% in Italy), of which 79% were for HFSS products.²⁹ Celebrity advertising endorsements, primarily for TV advertising, were more often for HFSS products than healthy foods in the UK³⁰ and the US,³¹ including sports celebrities (discussed further below).³² Analysis of social media advertising exposure to children aged 7-16 years

found that during 10 minutes of personal use, 72% were exposed to food advertising, primarily for HFSS products, and 17% were exposed to food adverts embedded in celebrity generated content.³³ Systematic reviews have found some evidence that licensed and brand characters increase food preference, choices, intake and purchasing behaviours of HFSS products.^{7 34 35} However, only narrative syntheses were possible, and there are further limitations of these reviews. Two of the reviews had broad research questions with characters not a major focus.^{7 34} In addition, one review was completed in 2012;⁷ another did not include purchasing behaviours as an outcome and included few search terms;³⁴ and the last review was not replicable as it did not include the search strategy and only children up to 11 years were included.³⁵ There is also a need for further research on the use of equity brand characters, which are 'unlicensed but commonly recognised cartoon characters', a current regulation 'loophole' specifically identified in the PHE report.¹⁸

No systematic reviews have been completed that specifically examine the impact of celebrities in HFSS advertising on children. One review examined food marketing tactics and included the use of endorsers, but were unable to draw conclusions based on the two relevant identified studies.³⁴ Celebrities are considered effective marketing tools, thought to work through evaluative conditioning, where liking of a product is the result of its pairing with a stimulus.³⁶ Of specific interest are sports celebrities and 'influencers'. The Advertising Standards Authority (ASA) defines 'influencers' as "people who have a significant social media (or online) following".³⁷ Qualitative research has shown that the association of some foods with sport celebrities can foster beliefs in children that 'high-energy' products are healthy and improve sports performance.³⁸ Since 2017, more than half of advertising spending was for digital advertising, including 'influencer' advertising.³⁹ A recent experimental study showed that adults identified, trusted and related more to influencers than 'traditional' celebrities, and that influencers resulted in higher purchase intentions for the advertised product.⁴⁰ The integration of advertisements into influencers 'real-life' social media posts has also been studied and these adverts have been shown to led to more positive brand effects in adults compared to commercial celebrity-endorsed advertising.⁴¹

Therefore, although reviews have been completed examining the impact of character use in the promotion of HFSS products to children, only narrative syntheses were possible and questions on the impact of unknown characters and impact of character type remain. No systematic reviews have been completed specifically examining the impact of celebrities, including influencers, in the promotion of HFSS products on diet-related outcomes in children. Due to these gaps in the literature, we aim to understand how both characters and celebrities used in marketing, specifically advertising and packaging, impact a range of children's diet-related outcomes.

Methodology

Research questions

This work relates to marketing, encompassing both packaging and advertising. Our research questions were similar for each review:

- Does exposure to marketing containing characters (study 1) or celebrities (study 2) impact children's diet-related outcomes, including:
 - Purchasing behaviours (requests, intentions, and actual purchases)?
 - Food preferences?
 - Food consumption (measured objectively, e.g. energy intake/quantity)?
- Are the responses to marketing impacted by:
 - The type of character (licensed versus equity brand) or celebrity (sports, YouTubers/influencers or other)?
 - Child characteristics including age, socioeconomic status (SES), family composition?
 - The format of marketing (content within advertisements versus on packaging)?
- What are the long-term impacts of these marketing formats (if data allow)?

What we did

We developed comprehensive search strategies for studies 1 and 2 in collaboration with colleagues from the Institute of Education. We conducted the searches for both reviews on 22nd of October 2019, using eight databases. Studies needed to fulfil the following criteria to be included (see [Table 1](#) and [Appendices 1 and 2](#)):

- Experimental with appropriate comparison group or 'real world' quantitative studies
- Participants aged between 0-16 years
- Published since 2009 in any country or language
- Outcome of food consumption, food preference, food purchasing behaviour

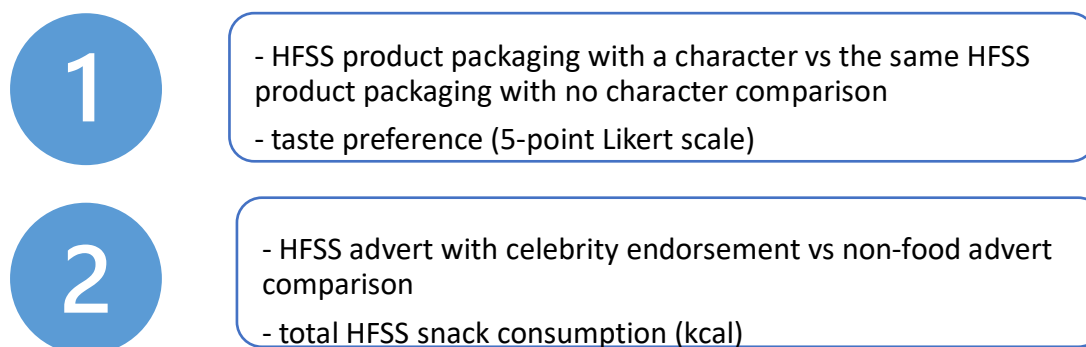
Two researchers (GS and KM) independently screened all articles on title and abstract (character, n=1317; celebrity, n=245) and on full text (character, n=112; celebrity, n=22). All screening was checked by JP and HC. GS, KM and JP extracted the following descriptive data: authors, country, year of publication, study design, sample size, age range and mean, advertising exposure, character (study 1) or celebrity type (study 2), comparison type, HFSS product, outcome type and measure and the quantitative data: sample size, mean, standard deviation, kcal for consumption measures or scale for preference and purchasing behaviour.

Table 1. Inclusion criteria

Study types	Exposure (intervention)	Exposure (character/celebrity)	Comparator	Outcomes
Experimental studies: Between-subjects or within-subjects Real world studies	HFSS Adverts television adverts, advergames, printed adverts, online adverts HFSS packaging product packaging, label, image of product	STUDY 1 Licensed character: Sesame Street, Sponge Bob SquarePants, Dora the Explorer Equity brand: Pom-Bear, Coco the Monkey, Mr Strings Unknown = bear, dinosaur, cockatoos STUDY 2 Sports celebrity (e.g. Gary Lineker), influencer/YouTuber, other (musicians, actors/ actresses)	HFSS Adverts with no character/celebrity HFSS packaging with no character/celebrity Healthy food advert Non-food advert	Consumption of HFSS product Purchase behaviours: -intention -request -actual purchases Preference: -product liking -taste rating -perceived taste rating -forced choice preference or snack selection

For inclusion in the meta-analysis, experimental studies needed a comparison of no advert or a non-food advert control to a HFSS advert with a character (study 1) or a celebrity (study 2) that measured the consumption, preference or purchase of a HFSS product. From the available studies, we were able to carry out two meta-analyses (Figure 2). For study 1, a meta-analysis was conducted comparing the taste preference (5-point Likert scale) between a HFSS product packaging with a character and the same HFSS product with no character. For study 2, a meta-analysis was conducted comparing the total HFSS snack consumption (kcal) between a celebrity HFSS advert and a non-food advert. Stata/SE 15.1 was used for meta-analyses. Due to a lack of studies that measured consumption or purchase behaviours (study 1) purchase and preference (study 2), meta-analysis of these outcomes was not possible. The consumption outcomes were standardised to report the total energy content consumed (kcal), which required conversion from volume (grams) using published nutritional values of the consumed products. Taste preference outcomes (study 2) were on 5-point Likert scales, therefore conversion was not necessary. A random effects model for both meta-analyses was used due to differences in exposure conditions (advert format, HFSS product, character or celebrity type).

Figure 2. Overview of meta-analyses carried out



What we found

- In study 1 we identified 14 studies (from 13 articles); four were eligible for meta-analysis ([Appendix 3](#)).
- In study 2, we identified six studies; three were eligible for meta-analysis ([Appendix 4](#)).

Study 1 – Characters

Participants were 2-13 years old. Studies were conducted in the US (n=7), UK (n=2), Belgium (n=1), Germany (n=1), Guatemala (n=1), Uruguay (n=1) and India (n=1). The HFSS marketing exposure was most commonly packaging (n=9), advergames (n=3) and TV or print adverts (n=2). The characters used in the exposures were licensed (n=7, including Dora the Explorer, SpongeBob SquarePants), unknown characters (n=6, variety of animals) and brand equity characters (n=4, including Coco the Monkey, Pom-Bear). The measured outcomes included preferences (taste rating, food liking, selection), consumption, purchase request and purchase intention. The experimental comparisons were product packaging without characters, non-food or healthy food advergames and licensed character compared to unknown character. See [Appendix 5](#) for the descriptive table.

Study 2 – Celebrities

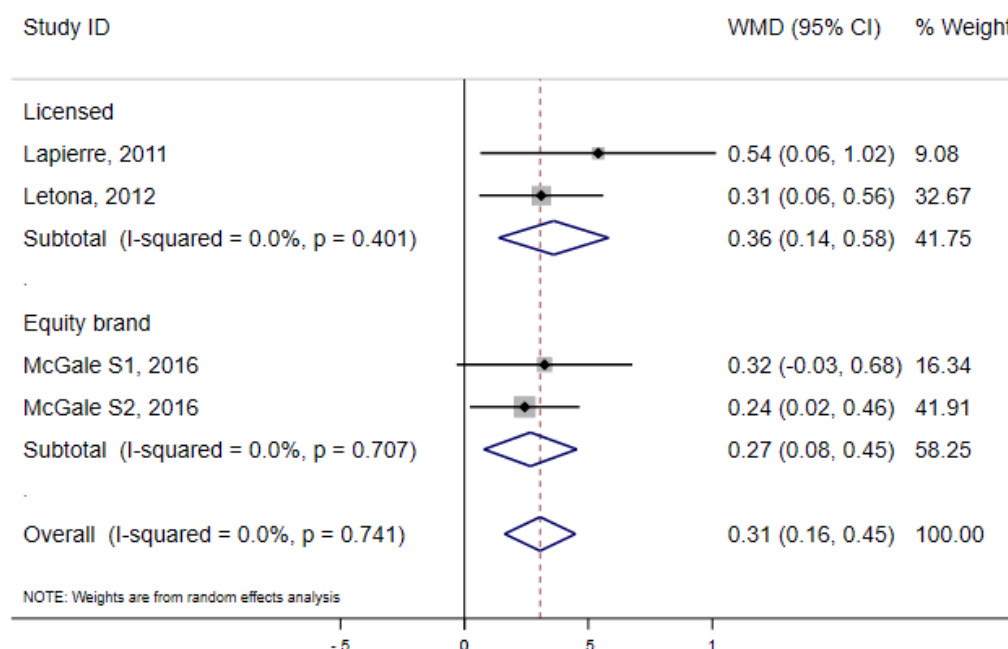
Participants were 7-17 years old. Studies were conducted in the UK (n=3), India (n=2) and Australia. The HFSS marketing exposures varied and included TV (n=2), online (n=2, Instagram, YouTube), print (n=1) and packaging (n=1). The celebrities included influencers (n=2), athletes (n=2), actors (n=2). The outcomes included ad libitum consumption, consumption intention, forced choice between HFSS product and alternate healthy snack, and purchase intention. The experimental comparisons were non-food adverts or non-celebrity endorsements. See [Appendix 6](#) for the descriptive table.

Meta-analyses

Study 1 – Characters

Children's taste preference for a HFSS food was significantly greater after exposure to HFSS packaging containing any type of character compared to packaging with no character (+0.31 on 5-point Likert scale; $p < 0.001$). See Appendix 9 for further detail. Similar results were found when we looked at brand equity and brand licensed characters separately, although there were only two studies in each analysis. We found no evidence of heterogeneity, indicating that the studies were similar enough to combine, or of publication bias.

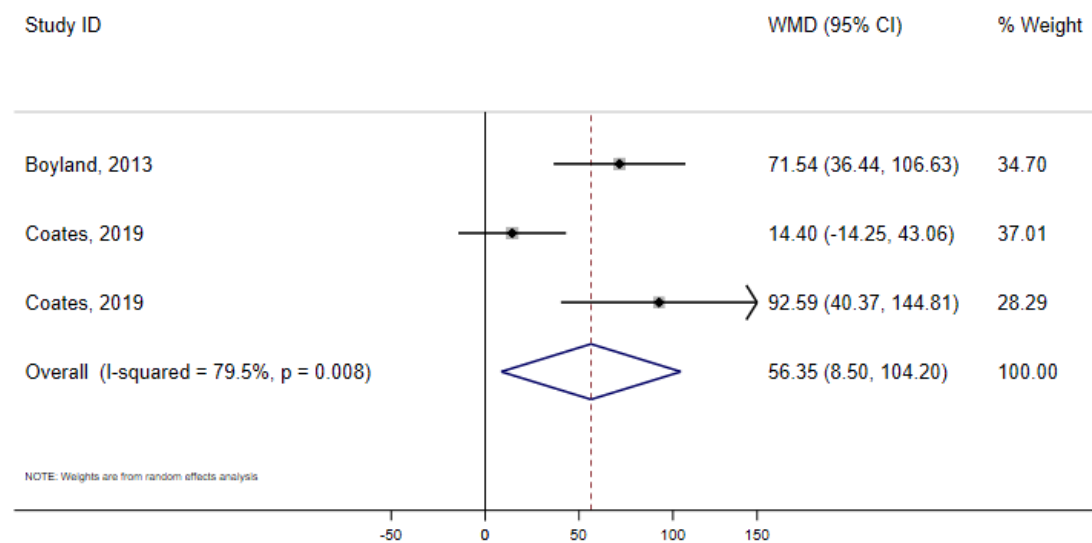
Figure 3. Forest plot showing mean difference (5-point Likert scale) in taste preference of HFSS products between HFSS packaging with and without a character in a HFSS advert, by character type



Study 2 – Celebrities

Children's food intake was significantly greater after exposure to HFSS marketing (advertising exposures in this case) with a celebrity compared to a non-food advert (+56.35 kcal; $p = 0.02$). See Appendix 9 for further detail. However, there were only three studies in this meta-analysis, and we found evidence of strong heterogeneity, indicating substantial differences between the effect sizes in the studies. We found low risk of publication bias.

Figure 4. Forest plot showing mean difference (kcal) in total snack consumption of HFSS products between celebrity HFSS advert and non-food advert.



Narrative synthesis

Study 1 - Characters

Seven studies measuring preference outcomes supported our meta-analysis findings and two did not. The studies that were consistent with our analysis found that the presence of characters significantly increased preference, including taste rating,^{42 43 44} food liking⁴⁵ and snack choice,^{46 47} compared to packaging with no characters. Of the other two studies, one compared characters in HFSS advergame to healthy or non-food advergame, with no significant impact found on forced snack choice.⁴⁸ The other study found that packaging without characters was chosen significantly more compared to packaging with licensed characters.⁴⁹ Four studies measured purchasing or consumption outcomes, with evidence suggesting that characters increased purchase requests and intentions.^{43 50 51 47} There was mixed evidence relating to the impact of characters by age. Five of the studies found it was not a significant factor,^{4 42 46 51} two reported a trend for younger participants to be impacted more for preference outcomes^{45 49} and two found that younger age significantly impacted preference outcomes (across 5-10 or 4-6 age range, respectively).^{43 52} SES was found to have no impact on taste rating outcomes in three.^{4 46} No studies compared the impact of advert format (e.g. TV advert versus advergame) or examined long-term effects.

Study 2 - Celebrities

Purchase outcomes were measured in one study, which found purchase intentions of an advertised HFSS product significantly increased following exposure to human celebrity HFSS product endorsement, compared to a non-food celebrity endorsement.⁵³ Preference was measured in one study, which found that when the product packaging featured a sports celebrity endorsement it was selected significantly more compared to the same product with no endorsement; however, this effect was only seen in boys.⁵⁴ Child characteristics did

not significantly predict outcomes; SES had no impact on preference,⁵⁴ and, age was not significantly associated to consumption in two studies.^{55 56} None of the included studies looked at the impact of advert format or long-term effects.

Comparison of characters and celebrities

One study directly compared characters and celebrity endorsement of a HFSS product and found that characters, compared to celebrities, led to significantly greater purchase intention of the advertised products in children aged 7-12 years.⁵⁷

Quality of studies

The risk of bias across the included studies was assessed as mostly low (see [Appendix 7 and 8](#) for bias assessment).

Discussion and policy implications

The findings from these two systematic reviews show that character and celebrity use in marketing impacts on various dietary outcomes for children. In study 1, we found consistent evidence that packaging using characters had a significant positive impact on product preference (including taste rating, food liking and snack choice), and that both character types appear to have a similar impact. Characters appear to positively impact consumption and purchase requests, but the evidence was more limited. There was some evidence that the impact of characters is greater among younger compared to older children, but there were no clear patterns of impact by SES. In study 2, we found evidence that the use of celebrity endorsement increases consumption of HFSS products, compared to non-food adverts. There was some evidence that the use of celebrities positively impacts on purchase intentions and preference (product choice) of HFSS foods in children. There was little evidence for child characteristics influencing the impact of advertising on child outcomes. Of particular relevance are the five studies conducted in the UK (all included in meta-analyses, two in study 1 and three in study 2). These were conducted by the same research group at the University of Liverpool and were assessed as having low to some concerns of bias. The results from the character review were consistent across countries and included studies was assessed as mostly low, giving us confidence in these findings.

Our findings are consistent with previous work that had suggested that use of character increases preferences for HFSS in children.^{34 35} We have also extended findings from those reviews on the impact of celebrities and the effect of characters on HFSS product purchase outcomes and consumption. We were also able to conduct the first meta-analyses examining the impact of characters and celebrities used in the marketing of HFSS products to children and further develop the research base. The meta-analysis finding of the consumption increase of 56.35kcal from exposure to celebrity HFSS advertising is also consistent with our previous work.⁵ Our review found that following exposure to a TV advert or advergames for food, children consumed an additional 60 kcal or 53.2 kcal,

respectively, compared to non-food advert exposure. This finding is significant as research has shown that even a small amount of over-eating leads to excess weight gain over time.⁸ There is potential for population-level interventions, such as policy changes to have substantial impact, even if effects are small at an individual level.

Characters and celebrities are used extensively to market HFSS products to children.^{27 28 29 30 31 32 33 34 35} The current advertising regulations in the UK differentiate based on character and celebrity type. Licensed characters and celebrities popular with children are not permitted in HFSS product adverts directly targeting pre or primary school-aged children. Comparatively, brand equity characters are permitted to be used 'to sell the products they were designed to sell', even if this is a HFSS product and they are targeting children. The meaning of 'celebrities popular with children' is not clearly defined by ASA, but it is clear that celebrities with general appeal are being used to successfully advertise HFSS products to children. Evidence suggests that the impact of celebrities on consumption continues when appearing in non-advertising contexts, which cannot be regulated.⁵⁶ The exposure of licensed characters outside advertising contexts is also a concern, as it also cannot be regulated (e.g. seeing licensed characters and celebrities in movies and TV shows).⁵⁶ Our findings support the tightening of all HFSS product advertising and packaging directed at children that contain characters of any sort and celebrities.

No HFSS adverts are permitted on children's TV channels or any medium (such as non-broadcast media: print, cinema, online and social media) where children under 16 years account for more than 25% of the audience. Therefore, HFSS adverts featuring characters and celebrities can be used during peak children viewing times (6-9 pm)² on family or adult programmes, such as X Factor and Great British Bakeoff which are popular with children.⁵⁸

The collection of online audience demographics is problematic, specifically of users under 16 years (used to determine if media is of 'particular appeal to children').⁵⁸ In a successfully upheld ASA ruling, Google Analytic data and sign-in user information from popular social media sites (Facebook, Instagram and YouTube) were accepted as evidence, despite Google policy preventing data collection from users under 18 and social media platforms requiring users to be aged 13 years and over.⁵⁹ In the UK, these user age restrictions are not followed and there is also the possibility that children may be accessing these sites through their parents' account or devices.² A pre-watershed ban on HFSS adverts (between 5:30 am and 9 pm) on both broadcast and non-broadcast online media, could be effective at overcoming these gaps in current regulations and lowering the exposure of characters and celebrities in advertising to children.⁵⁸ The way these restrictions are enforced has also been highlighted by the government as an area that may require examination.^{16 58 60} This research provides evidence that characters and celebrities, including influencers, are effective marketing tools. Our findings support regulation changes that both effectively enforce current online restrictions and that further expand restrictions beyond audience demographics, to lower advertising exposure to children and how they interact with broadcast and online media.

The use of characters and celebrities on product packaging is currently unrestricted and this has been identified as a weakness in UK regulations.⁶¹ A recent cross-sectional survey of character use on packaging in the UK found that over half of products featuring a character were classified as HFSS, primarily unlicensed.²⁸ The results from the meta-analysis in study 1

showed product packaging with characters significantly increased taste preference in children aged four to nine years old. To prevent the targeting of children, consideration of policies to extend CAP regulations to product packaging has been suggested, also the expansion to include all characters.²⁸

Limitations/ weaknesses

Only a small number of studies were eligible for meta-analyses. For the character review there were only four studies, although they were rated as having mostly low or some concerns of bias. For the celebrity review there were only three studies assessed as low-some concerns of bias, all of which originated from the same, although highly reputable, study team. The heterogeneity was high for the celebrity meta-analysis, but a random effects model was used to account for differences in the advertising exposures for both analyses. The criteria of only including papers from 2009 onwards did restrict the results but ensured that the findings were of most relevance for policy purposes. A further limitation is that all included studies were experimental, despite inclusion criteria including real world studies; therefore, we do not know how generalisable our findings are.

Our results support the following:

- Characters and celebrities both being subject to restrictions
- Restrictions being extended or adapted to cover packaging
- Treating influencers as celebrities

Appendix 1 – Details of search – character review (study 1)

Databases

- Ovid Medline
- Cochrane
- Scopus
- PsycInfo
- ProQuest (Central)- ASSIA
- Web of Science- social science and emerging sources
- Social Policy and Practice

Inclusion criteria/search terms

Participants	0-15 years	child* OR youth* OR adolescen* young people OR Young person* OR boy* OR girl* OR teen* OR Infant* OR preschool* OR toddler* OR minor* OR Babies OR Baby
Exposure (intervention)	Exposure to advertising of HFSS/unhealthy food advertisement using brand equity/licensed/mascot characters Exposure to packaging	advert* or (market* adj2 food) or (market* adj2 supermarket) or (market* adj2 buy*) or (promot* adj2 food) or (promot* adj2 supermarket) or (promot* adj2 buy*) or (promot* adj2 food) or (promot* adj2 supermarket) or (promot* adj2 buy*) or commercials or "TV commercial*" or "Television commercial*" or "radio commercial*" or "media commercial*" or digital adver* or digital market* or Mobile app* or Mobile application* or advergam* or Facebook or Instagram or Twitter or Snapchat or Youtube or Weibo or Wechat or Youku
Exposure (brand characters)	Exposure to brand equity/license/mascot characters within advertisement	brand* or equity* or character* or licens* or mascot* or figure* or cartoon*
Exposure (food)	Intervention vs. no intervention Comparison of HFSS food advertisement with characters and non-food advertisement control OR HFSS food advertisement with character compared to HFSS food advertisement without character Could also include a healthy food comparison group with OR without character.	food* or beverage* or Cola or Colas or Soda or sodas or (fizzy adj2 drink*) or (carbonated adj2 drink*) or (soft adj drink*) or high salt* or high fat* or high sugar* or snack* or sweet* or Meal* or HFSS
Outcome measure	Any of these: Measured energy intake (calories, grams or other units)/quantity of product consumed Ad libitum consumption of food Dietary behaviour Preference of food Like/dislike ratings Purchase request Purchase intentions	intake* or calori* or consumption* or food choice* or eating behavio* or snacking behavio* or preference* or favour* or favor* or purchas* or buy* or spend* or pester* or request* or liking
Study designs	Experimental; intervention (with or without a control group); real world studies	
Other Geography Languages Time	All All 2009-2019	

Appendix 2 – Details of search – celebrity review (study 2)

Databases

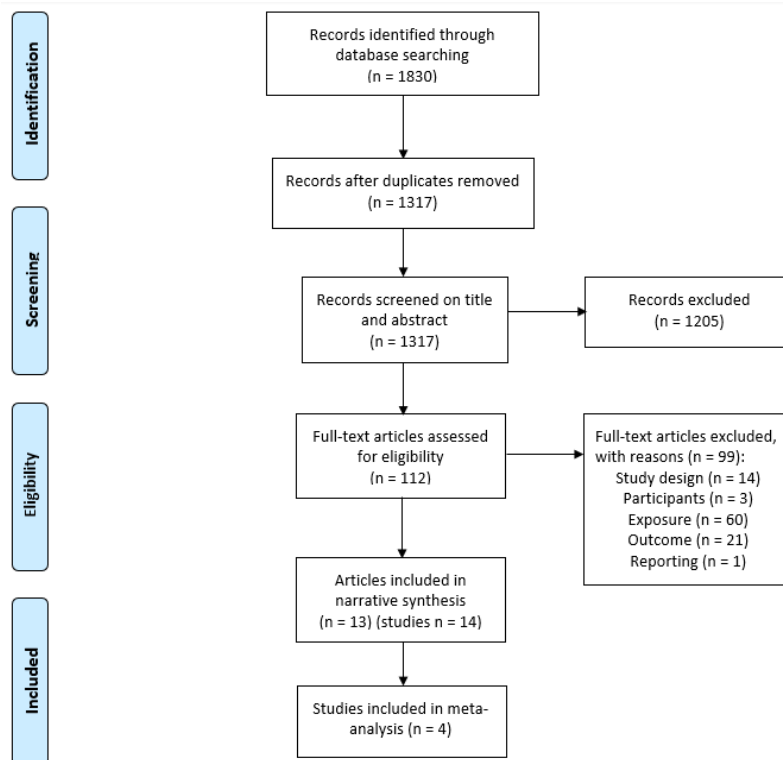
- Ovid Medline
- Cochrane
- Scopus
- PsycInfo
- ProQuest (Central)- ASSIA
- Web of Science- social science and emerging sources
- Social Policy and Practice

Inclusion criteria/search terms

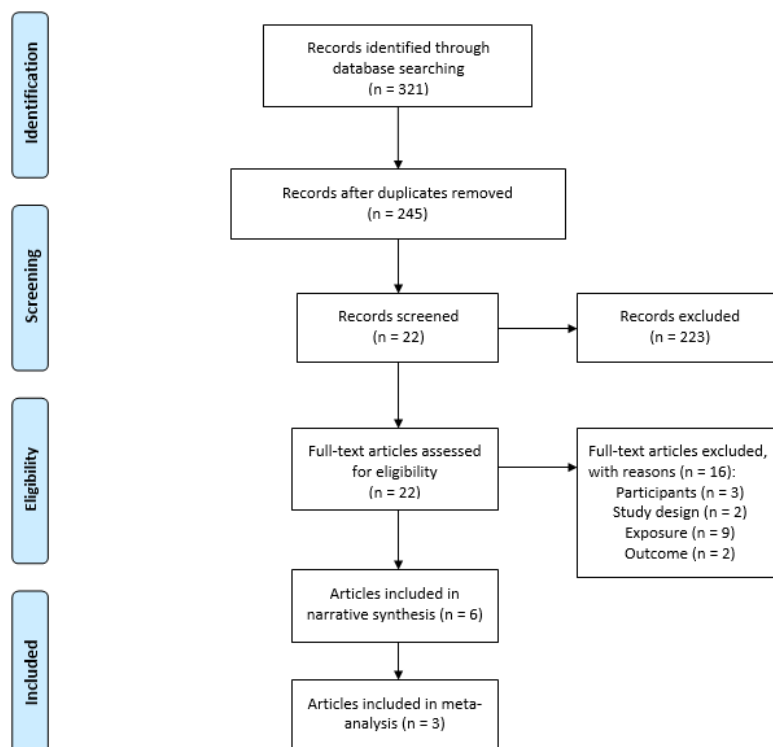
Participants	0-15 years	child* OR youth* OR adolescen* young people OR Young person* OR boy* OR girl* OR teen* OR Infant* OR preschool* OR toddler* OR minor* OR Babies OR Baby
Exposure (intervention)	Exposure to advertising of HFSS/unhealthy food advertisement using brand equity/licensed/mascot characters Exposure to packaging	advert* or (market* adj2 food) or (market* adj2 supermarket) or (market* adj2 buy*) or (promot* adj2 food) or (promot* adj2 supermarket) or (promot* adj2 buy*) or (promot* adj2 food) or (promot* adj2 supermarket) or (promot* adj2 buy*) or commercials or "TV commercial*" or "Television commercial*" or "radio commercial*" or "media commercial*" or digital adver* or digital market* or Mobile app* or Mobile application* or advergam* or Facebook or Instagram or Twitter or Snapchat or Youtube or Weibo or Wechat or Youku
Exposure (celebrities/influencers)	Exposure to advertising of HFSS/unhealthy food advertisement using celebrities/influencers	celebrit* or endors* or influencer* or ((professional or elit* or famous or public or renown* or well-known or acclaim* or eminent or prominent or illustrious or recogniz* or reput* or influential or wealth* or power*) adj1 (person* or people or figure* or leader or athlete* or player or bodybuilder or sport* or basketball or football or hockey or baseball or soccer or Olympian or singer* or songwriter* or musician* or band or group or rapper* or artist* or actor* or actress or star or Hollywood or Bollywood or Nollywood or dancer or writer or author or comedian or performer or model* or supermodel* or chef or philanthropist or politic* or president or minister or king or queen or prince* or monarch
Exposure (food)	Intervention vs. no intervention Comparison of HFSS food advertisement with characters and non-food advertisement control OR HFSS food advertisement with character compared to HFSS food advertisement without character	food* or beverage* or Cola or Colas or Soda or sodas or (fizzy adj2 drink*) or (carbonated adj2 drink*) or (soft adj drink*) or high salt* or high fat* or high sugar* or snack* or sweet* or Meal* or HFSS

	Could also include a healthy food comparison group with OR without character.	
Outcome measure	Any of these: Measured energy intake (calories, grams or other units)/quantity of product consumed Ad libitum consumption of food Dietary behaviour Preference of food Like/dislike ratings Purchase request Purchase intentions	intake* or calorj* or consumption* or food choice* or eating behavio* or snacking behavio* or preference* or favour* or favor* or purchas* or buy* or spend* or pester* or request* or liking
Study designs	Experimental; intervention (with or without a control group); real world studies	
Other Geography Languages Time	All All 2009-2019	

Appendix 3 – PRISMA flowchart of character review (study 1)



Appendix 4 – PRISMA flowchart of celebrity review (study 2)



Appendix 5 – Descriptive table of character experimental studies (study 1)

Author, Country, Year	Participants	Design	Advertising Intervention	Comparison	Outcome	Relevant Results	Risk of Bias
Ares et al Uruguay 2016	N = 239 (rating outcome, n=120; choice outcome, n=119) Age range = 6-12 Mean age = not stated	Experimental (school), within subject, position of labels randomised	Product label for HFSS foods (sponge cake and yogurt) with unknown characters (bear, dinosaur)	Product label of same HFSS products with no character	Food product rating on a 7-point hedonic scale. Forced choice of label 'they would like most' between pairs.	Selection of HFSS product label with character was significantly greater compared to label no character, regardless of age. Food product rating was not significantly different between labels with or without a character.	Some concerns
Enax et al Germany 2015	N = 179 Age range = 8-10 Mean age = not stated	Experimental (school), within subject, random assignment	Packaging of balanced 'snack meal' (yogurt cereal fruit snack) with unknown character on label (two blue cockatoos)	Packaging of same product with no character on label or health label	Taste rating on a 7-point Likert scale	Taste rating was significantly higher for character label compared to the plain or healthy label.	Low
Harris et al US (Study 2) 2012	N = 152 Age range = 7-12 Mean age = 9.4	Experimental (research centre), between subject, random assignment	Advergimes with HFSS products (Pop-Tarts and Oreo cookies) and brand equity character (PopTart characters) or unknown characters (Oreo advergence), 12 minute playing time	Advergence with healthy products (fruit and vegetables) or non-food advergence (Jewel Quest, Tumblebugs), 12-minute playing time	Ad-libitum snack consumption of HFSS products (crisps & cookies, fruit snacks & goldfish crackers) (grams) and healthy (grapes & carrots), 20 minutes	HFSS product consumption was significantly greater in HFSS advergence condition, compared to healthy advergence, and no significant difference compared to non-food advergence.	Low
Kotler et al US 2012	N = 343 Age range = 2-6 Mean age = 4	Experimental (research centre), between subject, random assignment	HFSS food image (crisps, chocolate, donut) with licensed character (Sesame Street) or unknown character sticker	HFSS or healthy food image with no character or healthy food image (fruit, vegetables) with character sticker	Forced preference choice (mix of food products and character conditions). Consumption of food (pieces) in subgroup of participants.	Preference was significantly greater in licensed character exposure, compared to unknown character and no character. Consumption increased with licensed characters compared to character, significance unclear.	Low

Lapierre et al US, 2011	N = 80 Age range = 4-6 Mean age = 5.6	Experimental (shopping centre), between subject, random assignment	Packaging of HFSS cereal with licensed character (Happy Feet)	HFSS cereal packaging with no character	Taste rating on a 5-point Likert scale (smiley face)	Taste rating was significantly higher in character packaging condition compared to no character	Some concerns
Letona et al Guatemala 2012	N = 121 Age range = 4.3- 11.5 Mean age = 7.4	Experimental (school), within subject, random assignment	Packaging of HFSS product (honey graham crackers and crisps) with licensed characters (SpongeBob SquarePants, the Pink Panther and El Chavo)	Packaging of same HFSS product with no character or healthy product (baby carrots) with or without character on package	Taste rating on a 5-point Likert scale (smiley face) of HFSS products (honey graham crackers, crisps)	Taste rating of HFSS products was significantly higher in character packaging condition compared to no character packaging.	Low
McGale et al UK 2016 Study 1	N=60 Age range=4-8 Mean age=6.9	Experimental (school), within subject, random assignment	Packaging of HFSS product (Cheesestings, Pom- Bear Potato Snacks and Coco Pops Snack Bar) with their brand equity characters (Coco the Monkey, Pom-Bear, Mr Strings)	Packaging of same HFSS products with no characters	Taste rating on a 5-point Likert- scale (smiley face). Preferred snack choice between matched pairs.	Mean taste rating of all products was significantly higher in character packaging condition, compared to no character. Snack choice was significantly higher for food item with a brand equity character, compared to no character.	Low
McGale et al UK 2016 Study 2	N=149 Age range=4-8 Mean age=6.9	Experimental (school), within subject, random assignment	Packaging of HFSS products (Cheesestings, Pom- Bear Potato Snacks and Coco Pops Snack Bar) with brand equity character of another product	Packaging of same HFSS products with no characters	Taste rating on a 5-point Likert- scale (smiley face). Preferred snack choice between matched pairs.	Mean taste rating of all products was significantly higher in character packaging condition, compared to no character Snack choice was significantly higher for food item with a brand equity character than an a no character food item.	Low
Ogle et al US 2017	N = 149 Age range = 6-9 Mean age = 7.36	Experimental (laboratory), within subject, random assignment	Packaging of HFSS product (dried fruit, bread, corn chips) with a licensed character (Lightning McQueen, Sponge Bob SquarePants, and Dora the Explorer)	Packaging of same HFSS product with no character or more healthful product with and without character	Forced product choice between pairs, of which food they would want to eat	Products without characters were chosen significantly more than products with characters.	Low

Putnam et al US 2018	N = 132 Age range = 4-5 Mean age = 4.8	Experimental (childcare facility), between subject, random assignment	Advergame with HFSS products (crisps/ SSB) with licensed character (Dora the Explorer)	Advergame with healthy products (fruit) and same licensed character or non-food advergame with no character	Snack and drink product choice for consumption (snack: banana OR 28 g crisps; drink: 227mL orange juice OR 213 mL can of Coca-Cola).	No significant differences in product choice by advergame condition (HFSS, healthy or non-food).	Low
Rifon et al US 2014	N = 276 Age range = 5-10 Mean age = 7.3	Experimental (school or university laboratory), between subject, random assignment	Advergame with HFSS product (cereal) with unknown character, either integrated or in background and children assigned to play or watch	Advergame with no food and same unknown character, children assigned to play or watch	Purchase request of HFSS product on a 5-point Likert-scale (thumbs). Perceived taste rating on a 5-point scale (stars)	Purchase request and taste expectations increased in both HFSS advergame conditions (play and watch), compared to control	Low
Roberto et al US 2010	N = 40 Age range = 3.8-6.2 Mean age = 5.0	Experimental (school), within subject, random assignment	Packaging of HFSS products (graham cracker, gummy fruit snacks) with a licensed character (Scooby Doo, Dora the Explorer, Shrek)	Packaging of same HFSS products without character or healthy product (carrot) with and without character	Food preference between matched pair. Taste rating on 5-point Likert scale (smiley-face). Forced choice of snack.	Food preference, taste rating and snack choice of HFSS products with characters on packaging were significantly greater than packaging with no characters.	Low
Smits & Vandebosch Belgium 2012	N = 57 Age range = 6-7 Mean age = 6.8	Experimental (school), between and within subject, random assignment	12-20-minute viewing of static images of HFSS food products (chocolate and cookies) and healthier food products (apples and grapes) promoted by celebrity gnome	12-20-minute viewing of static food product images promoted by unknown gnome	During-intervention, intended consumption frequency and intended frequency of purchase requests	Celebrity endorsement significantly increased intended purchase requests of both healthy and unhealthy food, with a larger impact on unhealthy	Some concerns
Solanki & Sheth India 2016	N = 200 Age range = 7-12 Mean age = not stated	Experimental (mall) within subject	TV advert and print advert of HFSS product (Kellogs Chocos) with celebrity endorser (Bollywood actress- Juhi Chawla)	TV advert and print advert of HFSS product (same:Kellogs Chocos) with animated character (Chhota Bheem)	Post-intervention, purchase intentions of food product	Purchase intentions of HFSS product were significantly lower in celebrity endorsed condition compared to character endorsed condition.	Some concerns

Appendix 6 - Descriptive table of celebrity experimental studies (study 2)

Author, Country, Year	Participants	Design	Advertising Intervention	Comparison	Outcome	Relevant Results	Risk of Bias
Boylard et al UK 2013	N = 181 Age range = 8-11 Mean age = 10.3	Experimental (school), between subject, random assignment	20-minute cartoon with 45 second TV advert for HFSS product (crisps) with sports celebrity endorser (Gary Lineker)	20-minute cartoon with 45 seconds food advert and no endorser, endorser in non-food advert and non-food advert	Post-intervention, ad libitum consumption of potato crisps, labelled branded and non-branded (grams)	Celebrity endorsed TV food adverts significantly increased intake of food, compared to food advert with no endorser and non-food advert.	Some concerns
Coates et al UK Eol 2019	N = 151 Age range = 9-11 Mean age = 10	Experimental (school), between subject, random assignment	5-minute YouTube video with 1-minute influencer marketing segment of branded HFSS product (chocolate biscuits), with and without disclosure	5-minute YouTube video with 1-minute influencer marketing segment of branded non-food product	Post-intervention, ad libitum consumption of cookies (kcal), labelled branded and non-branded, 5 minutes	Influencer endorsed HFSS advert significantly increased intake of promoted food, compared to non-food advert	Low
Coates et al UK SMI 2019	N = 176 Age range = 9-11 Mean age = 10.5	Experimental (school), between subject, random assignment	1-minute viewing of mock Instagram with image of YouTube influencer marketing HFSS product (chocolate biscuits)	1-minute viewing of mock Instagram with image of YouTube influencer marketing healthy product (banana) or non-food (sneakers)	Post-intervention, ad libitum consumption of HFSS products (candy, chocolate) and healthy (carrot, grapes) products (kcal), 10 minutes	Intake of HFSS products and overall snacks significantly increased following exposure to celebrity endorsement of HFSS products, compared to non-food condition. No significant effect of healthy snack endorsement on intake	Low
Dixon et al Australia 2014	N = 1302 Age range = 10-12 Mean age = 11	Experimental (online school), between subject, random assignment	Packaging of HFSS products (Cereal, cheese dips, chicken nuggets, ice cream, flavoured milk) with sports celebrity endorsement (male athletes)	Packaging of same HFSS products with no celebrity endorsement (no promotion)	During-intervention, forced choice of randomly allocated HFSS exposure or comparable healthier food pack, on a computer	Celebrity endorsed HFSS products were significantly more likely to be chosen compared to control, in boys only. No significant difference in girls.	Low

Jain et al India 2011	N = 378 Age range = 13-17 Mean age = not stated	Experimental (school), between subject, allocation not specified	5-10-minute viewing of print advertisement of HFSS product (chocolate) with celebrity endorsement (Hindi actor, Aamir Khan)	5-10-minute viewing of print advertisements of HFSS product with licensed character (Mickey Mouse) or no endorsement and non-food products (shampoo, TV) with celebrity, licensed character or no endorsement	Post-intervention, purchase intention product (scale NS)	Purchase intentions of HFSS product endorsed by a celebrity were significantly greater, compared to control or character endorsed HFSS product.	Some concerns/ HIGH
Solanki & Sheth India 2016	N = 200 Age range = 7-12 Mean age = not stated	Experimental (mall), within subject, random order allocation	TV advert and print advert of HFSS product (cereal, Kellogg's Chocos) with celebrity endorser (Bollywood actress- Juhi Chawla)	TV advert and print advert of same HFSS product with animated character (Chhota Bheem)	Post-intervention, purchase intentions of food product on a 5-point Likert scale (smiley)	Purchase intentions of HFSS product were significantly lower in celebrity endorsed condition compared to character endorsed condition.	Some concerns

Appendix 7 - Risk of bias assessment - character review (study 1)

	Randomization process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported result	Overall
Ares et al	?	+	+	+	+	?
Enax et al	?	+	+	+	+	+
Harris et al	+	+	+	+	+	+
Kotler et al.	+	+	+	+	+	+
Lapierre et al.	?	+	+	+	+	?
Letona et al	+	+	+	+	?	+
McGale et al S1	+	+	+	+	+	+
McGale et al S2	?	+	+	+	+	+
Ogle et al.	+	+	+	+	+	+
Putnam et al	?	+	+	+	+	+
Rifon et al	+	+	+	+	+	+
Roberto et al	+	+	+	+	+	+
Smits & Vandesbosch	?	+	+	+	+	!
Solanki & Sheth	?	+	+	+	+	!

 Low risk
 Some concerns
 High risk

Appendix 8 - Risk of bias assessment - celebrity review (study 2)

	Randomization process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported result	Overall	
Boyland et al	?	+	+	+	+	!	+
Coates et al	+	+	+	+	+	+	?
Coates et al	+	+	+	+	+	+	—
Dixon et al	+	+	+	+	+	+	
Solanki & Sheth	?	+	+	+	+	!	
Jain et al	+	?	+	+	+	!	

Appendix 9 - Meta-analysis results

	WMD (95%CI)	P-value	I ²	Eggers	Funnel	Trim + fill
HFSS preference: character HFSS ad vs non character						
Overall	0.305 (0.162, 0.448)	0	0.00%	0.079	Normal	2
Licensed	0.360 (0.138, 0.582)	0.001	0.00%			1
Equity	0.266 (0.078, 0.453)	0.005	0.00%			1
Total HFSS product consumption: celebrity HFSS advert and non-food advert						
Overall	56.35 (8.500, 104.201)	0.021	79.5%	0.347		2

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