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Normative misperceptions of unhealthy snacking amongst 11- to 12-year-old secondary school students.

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## Abstract

Younger adolescents are at an age where they have increasing control of their diet, and where peers become an important social reference for acceptable and normative dietary behaviours. These normative perceptions are often inaccurate and can lead to the development of unhealthy eating practices; although, the role of normative misperceptions of peers' unhealthy snacking behaviours in younger adolescents' personal snacking behaviours is not clear. The current study was a cross-sectional analysis of baseline data from a social norms-based healthy eating intervention sampling two secondary schools in deprived areas of England. Students aged 11-12 years ( $n = 252$ ) completed self-report measures of their demographic characteristics and personal behaviours, attitudes, intentions, and normative perceptions (descriptive and injunctive norms), relating to unhealthy snacking. Results indicated students overestimated peers' daily unhealthy snacks consumption by approximately 3.2 portions, misperceived peers to have more positive attitudes towards unhealthy snacking and more negative attitudes towards reducing snacking. The greater these misperceptions of peers' behaviours and attitudes, the more likely students were to consume unhealthy snacks and have positive attitudes about unhealthy snacking. Girls had a stronger intention to reduce their snacking behaviours if they had more positive attitudes to reducing snacking behaviours and misperceived peers to also have a positive attitude. In summary, 11- to 12-year-olds misperceive the snacking behaviour and attitudes of their peers, and such normative misperceptions are associated with students' own snacking behaviours and attitudes. Interventions which challenge these misperceptions may assist in reducing the social acceptability of unhealthy snacking and in reducing unhealthy snacking amongst young adolescents.

Keywords: *Adolescents, snacking, misperceptions, intentions, social norms.*

Author Accepted Version

## 1. Introduction

Adolescence is a period where rapid physical and cognitive changes occur (Özdemir et al., 2016) and optimal nutrition within this period is essential for healthy development (Racey et al., 2016). The progression into early adolescence (11-12 years of age) is where adolescents have increasing responsibility over their own diet and can lead to the development of unhealthy dietary behaviours (Must et al., 1992), such as frequently consuming unhealthy snacks (e.g. chocolate), skipping meals, and having a low intake of fruit and vegetables (Bailey et al., 2018; Brooks et al., 2015; Larson & Story, 2013). Research also indicates that adolescents are more likely to engage in these unhealthy dietary practices if they live in areas of deprivation (Kinra et al., 2000; Thomas et al., 2019). It is widely accepted that unhealthy eating patterns that are formed in adolescence tend to persist into adulthood and can lead to longer-term health-comprising conditions, e.g. obesity (Public Health England, 2020). Encouraging healthy eating practices amongst adolescents may be critical in reducing the risk of developing long-term health conditions and to promote normal development (Kell, 2015; Public Health England, 2019).

Developing effective strategies to improve adolescents' eating behaviours requires an understanding of what influences the development and maintenance of unhealthy dietary behaviours. Stok et al. (2014) suggest that social norms may be an important influence on unhealthy eating practices in adolescents. Social norms are described as unwritten rules that outline acceptable behaviours and/or attitudes of a group (Cislaghi & Heise, 2018). As children transition into adolescence (11-12 years of age), they spend an increasing amount of time with peers, and peers become an important social referent (Rohrbeck, 2003; Story et al., 2006). Adolescents have a strong desire to belong and to be accepted by their peer group

(Coleman, 2011), and adolescents tend to use the perceived dietary behaviour and attitudes of peers as a guide for their own dietary behaviours ([Authors, Year - blinded for peer review]; Perkins et al., 2018). For example, Perkins et al. (2010) found that secondary school students (11-18 years old) consumed more sugary beverages themselves if they believed that peers also did so. However, these perceptions are not always accurate as they do not always reflect peers' actual reported behaviour and/or attitudes (Lally et al., 2011). For example, Lally et al. (2011) found that older adolescents (16-19 years of age) overestimated peers' consumption of unhealthy snacks and perceived peers to have a more positive attitude towards unhealthy snacking than they actually had. The greater these overestimations, the increased likelihood that individuals will engage in unhealthy behaviours (Berkowitz, 2005), for example, consuming a large number of unhealthy snacks.

An evidence-based approach has developed which focuses on the influence of misperceptions of the social norms of a variety of positive and negative health behaviours, on personal behaviours (the "Social Norms Approach") (Dempsey et al., 2018). The Social Norms Approach operates on the assumption that individuals often misperceive the behaviour and attitudes of their peers, and that these commonly-held misperceptions can lead to an increase in personal unhealthy behaviours (Perkins & Berkowitz, 1986). Pluralistic ignorance may lead individuals to believe that their behaviour and/or attitudes (e.g. not consuming alcohol) are not aligned with the norm (e.g. consuming alcohol) when their behaviour actually is the norm (Schroeder & Prentice, 1998). This can occur when an individual witnesses another individual's highly memorable behaviour (e.g. consuming a large amount of alcohol) and incorrectly assuming that to be the norm. Individuals, it is suggested, avoid behaviours and attitudes that are incorrectly believed to be non-normative and alternatively engage in

unhealthy behaviours that are incorrectly perceived to be normative (Kim et al., 2005) in response to perceived social pressures (Deutsch & Gerard, 1955).

The Social Norms Approach focuses on two different types of norms which influence behaviour: descriptive norms (the perceived behavioural practices of peers); and injunctive norms (perceived attitudes or perceived approval of peers) (Perkins & Berkowitz, 1986). There is a considerable amount of evidence that supports that adolescents often misperceive the prevalence of unhealthy behaviours (descriptive norm) in their peers and believe peers to be more accepting of these behaviours (injunctive norm), which can impact an individual's behaviour (Amialchuk et al., 2019; Lintonen & Konu, 2004; Perkins et al., 2019). Amialchuk et al. (2019) found that adolescents' (11-19 years old) overestimation of peers' substance abuse (alcohol, cigarettes and marijuana) was related to an increase in individual use of these substances one year later. Research indicates that interventions that aim to challenge current normative misperception, by presenting individuals with accurate normative information, can lead to a reduction in the unhealthy behaviour (Linkenbach & Perkins, 2003), changes in related attitudes (Perkins et al., 2011) and a stronger intention to reduce the unhealthy behaviour (Hogg & Reid, 2006; Reid & Aiken, 2013). There is some suggestion that there may be a stronger relationship between social norms and personal behaviours (Perkins et al., 2010), related attitudes (Stok, 2014), and behavioural intentions in adolescents compared to other age groups (Rivis & Sheeran, 2003; Zaleski & Aloise-Young, 2013), as adolescents are heavily influenced by their perceptions of what is deemed to be socially-acceptable behaviour (Rivis & Sheeran, 2003; Story et al., 2006). When aiming to improve unhealthy behaviours in adolescents, it is important to consider current normative perceptions and how they are associated with personal behaviour [Authors, Year - blinded for peer review], related

attitudes (Rice & Klein, 2019) and intentions to reduce the unhealthy behaviour (Zaleski & Aloise-Young, 2013).

To date, there has been limited research that utilises the Social Norms Approach to understand and challenge current normative misperception as a way to improve unhealthy dietary behaviours, and there is no research to our knowledge that uses this approach to understand eating behaviours with young adolescents (11-12 years old). The current study aimed to investigate whether there are discrepancies between actual snacking-related behaviours and attitudes and perceived snacking-related norms of 11- to 12-year-olds, and investigate the extent to which these misperceptions are associated with students' own snacking-related behaviours, attitudes and intention to reduce snacking. This paper focuses on baseline data of a social-norms-based healthy eating intervention targeting 11- to 12-year-olds secondary school students.

Based on the previously discussed research (Amialchuk et al., 2019; Berkowitz, 2005; Lally et al., 2011; Lintonen & Konu, 2004; Perkins et al., 2010; Perkins, Perkins, et al., 2019), it was hypothesised that: (1) students will misperceive peers to consume more unhealthy snacks and have more positive attitudes towards unhealthy snacking, than the reported group norm; (2) students who overestimate peers' unhealthy snacking behaviour and misperceive peers to have positive attitudes towards unhealthy snacking will consume more unhealthy snacks themselves; (3) students who perceive peers to have more positive attitudes about unhealthy snacking will have more positive attitudes themselves about consuming unhealthy snacks; (4) students' normative misperceptions about unhealthy snacking will be associated with personal intentions to reduce unhealthy snacking.



## **2.Methods**

### **2.1 Design and Participants**

The present study was a cross-sectional analysis of baseline data of a social-norms-based healthy eating intervention targeting secondary school students in deprived areas of the UK. Two secondary schools from the North and Midlands of England were involved in the study, both schools being located within the 30% most deprived areas of England (Noble et al., 2019; Smith et al., 2015). An a-priori power analysis revealed that a minimum of 200 participants (100 per school) was required, to achieve a desired power of 0.8 with medium effect size ( $R^2 = 0.13$ ) for a series of hierarchical multiple regression to be conducted (Clark-Carter, 2018). Cohen (1992) suggests using a medium effect size as it would approximate the average sample size observed across various fields. All students from (school) Year 7 (aged 11-12 years) were eligible to participate and a total of 252 students (125 males and 127 females; School A = 157; School B = 95) completed a paper-based questionnaire in September 2017. The average questionnaire response rate across schools was 70%.

### **2.2 Procedure**

Guardians and students were informed of the study via letters sent home from the respective schools, which included guardian/parent opt-out consent forms. Students who were interested in participating after reading the study information were asked to provide their own informed consent via a consent form prior to completing a paper-based questionnaire. Data collection was facilitated by teachers and was completed during school hours within a

timetabled teaching session. The project was approved by [name removed until accepted for publication] Ethics Committee.

## **2.3 Measures**

The questionnaires were developed, considering relevant research, and in collaboration with the schools. The key contact within both schools reviewed the questionnaires to check language and understandability, as schools indicated that literacy and understanding of students was below age-related expectation. Focus groups conducted in both schools prior to this study identified that there were differences between boys and girls in their beliefs about eating behaviours, and in the perceived social influences on their own dietary behaviour [Authors, Year - blinded for peer review]. Based on the results of these focus groups, questionnaires included normative items that referred to same-sex same-school peers. The student focus groups also identified foodstuffs that were commonly referred to as unhealthy snacks within the target population and the frequency of consumption of these foodstuffs was measured within the questionnaire (e.g. chocolate, crisps). Demographic data including students' sex and date of birth were collected.

### **2.3.1 Dietary Behaviours**

Students' personal dietary behaviours were assessed using an adapted version of a food frequency questionnaire (FFQ) previously used by Lally et al. (2011). The items asked students to self-report how often they consumed chocolate, sweets, crisps, biscuits and cake, over the previous week and each foodstuff had a specified portion size (e.g. one slice of cake or a

cupcake). Portion sizes were equal to one serving for each foodstuff based on a previously used and validated adolescent food frequency questionnaire (Rockett et al., 1995). Response options ranged from 'less than once a week' to '4 or more a day'. An example of an item wording is, *'thinking back over the past week, how many servings of these foods did you eat?'*. For the analysis response options 'don't know', 'less than one a week', '1 a week', '2-3 a week', '4-6 a week', '1 a day', '2 a day', '3 a day', '4 or more a day' were converted into values to reflect frequency of consumption per week. For example, 'less than once per week' was coded as 0.5 up to '4 or more a day' which was coded as 28. A summary measure of snacking behaviour over a week was constructed by summing responses to chocolate, sweets, crisps, biscuits and cake. The internal reliability (Cronbach's alpha) for these items combined was 0.70.

### **2.3.2 Snacking attitudes**

Students' personal attitude towards snacking was assessed using two separate items (these items were not summed together). *'In general, do you think that eating two or more unhealthy snack foods on most days is?'* and *'For me to eat fewer unhealthy snacks over the next month would be'*. The item wording and scales were previously used by Lally et al. (2011) and Sheridan (2014). Students indicated their personal attitude on a pair of Likert scales ranging from 1 (bad) to 5 (good), and 1 (foolish) to 5 (sensible), which were summed to give a total attitude score ranging from 2-10 for each item.

### **2.3.3 Descriptive and injunctive Norms**

Students' normative perceptions of their peers' dietary behaviours were assessed by asking how often over the previous week students thought the majority of same-sex peers at their school consumed chocolate, sweets, crisps, biscuits, cake. Response options ranged from 'less than once a week' to '4 or more a day'. An example of an item was: *'how many servings of each of the following do you think most of the [boys/girls] at [school name] have eaten over the past week?'*. The wording of the social norms item were adapted from existing measures (e.g., Pischke et al., 2015; Lally et al., 2011). Chocolate, sweets, crisps, biscuits, cake descriptive norm responses were summed to give an unhealthy snacking norm score and internal reliability (Cronbach's alpha) for these items combined was 0.82. For the analysis, options were coded into the same values as personal dietary behaviours.

Students' normative perceptions about same-sex peer attitude towards snacking were assessed by two separate items based on previous research (Lally et al., 2011; Sheridan, 2014): *'In general, do you think that most of the [boys/girls] at [school name] think that eating two or more unhealthy snack foods on most days is?'* and *'In general, do you think that most of the [boys/girls] at [school name] think that eating fewer unhealthy snacks would be?'*. Students indicated their beliefs about peers' attitude using the same rating scale as own snacking attitude.

#### **2.3.4 Behavioural Intentions**

Students' intention to reduce unhealthy snacking was assessed by four items on a 7-point Likert scale ranging from 1 (unlikely/false) to 7 (likely/true). The wording and scale selected was recommended by Ajzen (1991) and had been adapted by others for unhealthy snacking behaviours (Sheridan, 2014; Verhoeven et al., 2013). An example item is: *'I intend to eat fewer*

*unhealthy snacks over the next month*'. The four item scores were summed to give a total intention score and internal reliability (Cronbach's alpha) for these items combined was 0.74. The higher the intention score, the stronger the intention to reduce unhealthy snacking.

## **2.4 Analysis**

Misperceptions of behaviour were calculated as suggested by Perkins et al. (2010) by subtracting the median of self-reported unhealthy snacking behaviour of the group (actual norm) from each student's reported perception (descriptive) of peers' unhealthy snacking behaviour. Perkins et al. (2010) recommended using the median rather than mean because the median allows a response category to be selected, whereas the mean may produce a response that may fall between two categories. A positive score indicated that students perceived peers to consume the foodstuff more often than the reported group norm.

Misperceptions of peers' attitudes were calculated using the same method as for misperceptions of behaviour: by subtracting the median score of self-reported attitude of the group (actual norm) from each students' reported perception score of peers' attitudes (injunctive norm). This created two attitude misperception scores: (1) peers' attitude towards unhealthy snacking; and (2) peers' attitude towards reducing unhealthy snacking. A positive score indicated that students thought that their peers had a more positive attitude towards the behaviour than was the actual reported group norm. Students needed to have completed in full the questions about behaviour/attitude and the questions about normative perception (descriptive/injunctive) to enable calculation of the misperceptions score. Therefore, only students with complete data in these variables were included in the analyses (tables 2 and 3).

To test whether students significantly misperceived peers' unhealthy snacking behaviour and attitudes, a series of one-sample tests were conducted comparing mean misperception scores to a test value of zero, based on previous research (Lally et al., 2011). Finally, three linear multiple regressions were conducted to explore whether students' normative misperceptions were associated with: (1) students' personal snacking behaviour; (2) attitudes towards unhealthy snacking; and (3) intention to reduce snacking.

### 3. Results

#### 3.1 Data screening

The data were screened for missing values, normality, and multivariate outliers. There were a number of missing values across the dataset and Little's test indicated that data values were missing not at random (MNAR),  $\chi^2 = 3099.882$ ,  $p < .001$ . Although there was some indication that students who reported a weaker intention to reduce unhealthy snacking, were less likely to fully report their personal unhealthy snacking consumption (by not completing all snacking behaviour measures) this did not change the outcomes of the analyses. A sensitivity analysis was conducted with frequency scores being substituted by a median and scale scores being substituted by a mean. Conducting sensitivity analysis when data is MNAR will help ensure that conclusions drawn from the original data are robust (Little et al., 2012; Thabane et al., 2013). The results from the substituted data were not dissimilar from original data; therefore, no further action was taken, and the original data will be reported.

Subsequently, distribution for all variables was examined; all variables were normally distributed (all skewness and kurtosis values were within the -1 to +1 range), with the

exception of personal unhealthy snacking behaviours (skewness 2.37 and kurtosis 7.40) and misperceptions of peers' unhealthy snacking behaviour (skewness 1.72 and kurtosis 2.86). Therefore, when investigating whether students significantly misperceived peers' unhealthy snacking behaviour, a non-parametric one-sample test was conducted. Literature suggests that regressions are robust against violation of normality of variables (Clark-Carter, 2018; Field, 2013), so no further action was taken prior to conducting the regression analyses.

To screen for multivariate outliers among the variables, standardized residuals were reviewed, and Mahalanobis distance scores were generated for the predictor variables. There was one case with a standardized residual (4.94) outside of the range of +/- 3.29 (Field, 2013) and which also exceeded the critical Chi-square value of above 24.32 (at  $\alpha = .001$ ) (Barnett & Lewis, 1984). Examination of the case revealed that the individuals' response pattern indicated a systematic reporting of extreme scores. This case was removed from the dataset consistent with recommendations from Leys et al. (2018) as such cases may indicate participants may not be attending to questions or may have misunderstood the content.

### **3.2 Students' personal snacking behaviour**

Results indicated that students' average reported weekly intake of unhealthy snacks was 19.15 portions (approx. daily intake of 2.7 portions). Table 1 presents the means and standards deviations of reported personal weekly consumption of each unhealthy snack.

- Table 1 about here -

### **3.3 Differences between males and females**

A series of independent sample t-tests were conducted to understand if there was a significant difference between males' and females' personal unhealthy snacking consumption, related attitudes, and intention to reduce unhealthy snacking (Table 2). The t-tests for personal unhealthy snacking consumption and behavioural intention were significant and the means indicated that male students consumed more unhealthy snacks and have a weaker intention to reduce unhealthy snacking compared to female students.

- Table 2 about here -

### **3.4 Students' normative perceptions about unhealthy snacking**

Testing hypothesis one, a series of one-sample tests were conducted comparing mean misperceptions scores to a test value of zero. The misperceptions of peers' unhealthy snacking behaviour variable was not normally distributed; therefore, a one-sample Wilcoxon signed rank test was conducted to examine whether students significantly misperceive unhealthy snacking behaviour of their peers compared with a test value of zero. The one-sample Wilcoxon signed rank test demonstrated that students significantly overestimated peers' weekly unhealthy snack consumption, on average, by 22.27 portions per week (approx. daily overestimation of 3.2 portions) above the reported group norm (Table 3).



- Table 3 about here -

Two one-sample t-tests were conducted to examine whether students significantly misperceived unhealthy snacking related attitudes of their peers compared to a test value of zero. Both t-tests were statistically significant; the means indicated that students misperceived peers to have more positive attitudes towards consuming unhealthy snacks than the reported group norm, and misperceived peers to have more negative attitudes towards reducing unhealthy snacking than the reported group norm (Table 4).

- Table 4 about here -

### **3.5 Regression analyses**

#### ***3.5.1 The role of perceived norms in predicting students' unhealthy snacking***

Testing hypothesis two, the first regression explores the association between students' misperceptions of peers' snacking behaviour and related attitudes, with students' personal unhealthy snacking consumption. Students' sex and personal attitude towards unhealthy snacking were controlled and entered as a covariates in Block 1 of the regression (as previously-conducted focus groups indicated there could be sex differences in beliefs and perceptions [Authors, Year - blinded for peer review] and as personal attitudes may influence personal behaviour; Bem, 1972), while misperceptions about peers' snacking behaviour and misperceptions about peers' attitude towards unhealthy snacking were entered in Block 2.

The regression indicated no evidence of collinearity after conducting diagnostic tests, and an analysis of standard residuals revealed no cases to be outside the range +/- 3.29 (Field, 2013).

Personal attitude towards unhealthy snacking and students' sex were not significant predictors of personal unhealthy snacking behaviour in Block 1,  $F(2, 161) = 2.179, p = .116$ . Block 2 accounted for 8.5% of the variance in personal unhealthy snacking behaviour, and adding the second Block led to the overall model becoming statistically significant,  $F(4, 159) = 3.691, p = .007$ , with misperceptions of peers' unhealthy snacking behaviour ( $\beta = 0.16, p = .035$ ) and misperceptions of peers' attitude towards unhealthy snacking ( $\beta = 0.18, p = .028$ ) being significant predictors of personal unhealthy snacking behaviour (Table 5). These results indicate that those students who overestimated peers' unhealthy snacking behaviour, and misperceived peers to have more positive attitudes towards unhealthy snacking, reported consuming a greater number of unhealthy snacks themselves.

- Table 5 about here -

### ***3.5.2 The role of perceived norms in predicting students' personal snacking attitude***

Testing hypothesis three, the second regression tested the association between students' normative perceptions of peers' attitudes and students' personal attitudes towards unhealthy snacking. In this regression analysis, students' sex and personal unhealthy snacking behaviour were controlled and entered as a covariates in Block 1 (as previously-conducted focus groups indicated there could be sex differences in beliefs and perceptions [Authors, Year - blinded for peer review] and as there can be an association between personal behaviours and

personal attitudes; Hearty et al., 2007), while misperceptions about peers' snacking attitude towards unhealthy snacking were entered in Block 2.

The regression indicated no evidence of collinearity after conducting diagnostic tests. An analysis of standard residuals was also carried out on the data to identify any outliers, which indicated that one case (below 1% of the sample cases) was outside the range +/- 3.29 (Field, 2013). The outlier (3.419) was removed and the regression was re-run, and as there was little difference between the regressions' results, therefore the original regression results are reported here.

Personal unhealthy snacking behaviour and students' sex were not significant predictors of personal attitudes for unhealthy snacking in Block 1,  $F(2, 161) = 1.312, p = .272$ . Block 2 accounted for 12.1% of the variance in personal attitude towards unhealthy snacking, and adding the second Block led to the overall model becoming statistically significant,  $F(3, 160) = 7.358, p < .001$ , with misperceptions of peers' attitude towards unhealthy snacking ( $\beta = 0.33, p < .001$ ) being a significant predictor of personal attitude towards unhealthy snacking (Table 6). The results suggest that students who misperceive peers to have positive attitudes towards unhealthy snacking had a positive personal attitude towards unhealthy snacking themselves.

- Table 6 about here –

### ***3.5.3 The role of perceived norms in predicting students' intentions to reduce unhealthy snacking***

Testing hypothesis four, the third regression investigated the association between students' misperceptions of peers' snacking behaviour and related attitudes with students' intentions to reduce unhealthy snacking. Students' sex and personal attitude towards reducing unhealthy snacking were controlled and entered as a covariates in Block 1 of the regression (as previously-conducted focus groups indicated there could be sex differences in beliefs and perceptions [Authors, Year - blinded for peer review] and as personal attitudes are suggested to influence behavioural intention; Ajzen and Fishbein, 1972), while misperceptions about peers' unhealthy snacking behaviour and misperceptions about peers' attitudes towards reducing unhealthy snacking were entered in Block 2. The regression indicated no evidence of collinearity after conducting diagnostic tests, and an analysis of standard residuals revealed no cases to be outside the range +/- 3.29 (Field, 2013).

Students' sex and personal attitude towards reducing unhealthy snacking contributed significantly to Block 1 of the model  $F(2, 157) = 13.749, p < .001$ , and accounted for 14.9% of the variance in intention to reduce unhealthy snacking. Block 2 accounted for a further 6.1% of the variation in intention to reduce unhealthy snacking,  $F(4, 155) = 10.320, p < .001$ , with students' sex ( $\beta = 0.18, p = .018$ ), misperceptions of peers' attitude towards reducing unhealthy snacking ( $\beta = 0.27, p = .001$ ) and personal attitude towards reducing unhealthy snacking ( $\beta = 0.21, p = .009$ ) being significant predictors of intention to reduce unhealthy snacking (Table 7). The results suggest that girls who had positive personal attitudes towards reducing unhealthy snacking and misperceived peers to have a positive attitude towards reducing unhealthy snacking, had a stronger intention to reduce unhealthy snacking behaviour.

- Table 7 about here -

#### 4. Discussion

The aim of this study was to investigate whether 11- to 12-year-old students misperceive peers' snacking-related behaviour and attitudes, and whether these misperceptions are associated with personal unhealthy snacking, related attitudes, and intentions to reduce unhealthy snacking. In sum, the results confirmed the existence of attitudinal and behavioural unhealthy snacking misperceptions and demonstrate they are important influencing factors in personal unhealthy snacking behaviour, related attitudes, and intentions to reduce unhealthy snacking amongst younger adolescents.

In support of the first hypothesis, the findings indicate that 11- to 12-year-olds significantly misperceive peers to: consume more unhealthy snacks; be more accepting of unhealthy snacking; and have less favourable attitudes towards reducing unhealthy snacking, than the reported group norm. These results extend previous research (Amialchuk et al., 2019; Lewis & Neighbors, 2006; Lintonen & Konu, 2004; Perkins & Craig, 2006; Perkins, Krezanoski, et al., 2019) by offering a first insight into current normative snacking-related misperceptions of younger adolescents. The findings confirm the existence of snacking-related misperceptions within 11- to 12-year olds, and reflect prior observation that individuals tend to overestimate unhealthy behaviours of peers and inaccurately perceive that they are more accepting of these behaviours (Amialchuk et al., 2019; Lintonen & Konu, 2004; Perkins et al., 2019). Establishing whether normative misperceptions exist within a population is an important initial stage towards challenging these inaccurate normative perceptions (Berkowitz, 2004)

As hypothesised, students who overestimated peers' unhealthy snacking consumption, and misperceived peers to have more positive attitudes towards unhealthy snacking, consumed more unhealthy snacks themselves. The current study builds on previous research by demonstrating that inaccurate perceptions of both peers' snacking consumption, and snacking-related attitudes, are associated with personal snacking behaviour in young adolescents (Lally et al., 2011). The identification of normative misperceptions as significant predictors of students' personal unhealthy snacking consumption provides support for the important influence of norms on personal behaviour amongst younger adolescents. It seems within 11-to 12-year-olds, that peers serve as an important social referent regarding unhealthy snacking.

Supporting the third hypothesis, the current study found that young adolescents who perceive peers to have a more positive attitude towards unhealthy snacking, had a more positive attitude themselves about consuming unhealthy snacks. Complying with such perceived injunctive norms may reflect adolescents' desire for peer approval (Coleman, 2011). These findings contribute to the social norms literature as no other study, to our knowledge, has explored the association between injunctive normative perceptions (perceptions about what others approve of) and personal attitude towards unhealthy snacking in this age group. These findings are in line with those reported for other health-related behaviours amongst older age groups (e.g. alcohol, tobacco, cannabis and other drug use) which have demonstrated an association between inflated perceptions about peers' approval of an unhealthy behaviour and increased personal approval of the behaviour (Dempsey et al., 2016; Helmer et al., 2016).

When testing the fourth hypothesis, the results indicated that girls who had positive personal attitudes towards reducing unhealthy snacking and inaccurately perceived peers to have a more positive attitude towards reducing unhealthy snacking, had a stronger intention to reduce unhealthy snacking themselves. This indicates that there are differences between boys and girls in their beliefs and in their perceived social influences which influence their behavioural intention [Authors, Year - blinded for peer review]. There is limited research that has explored the relationship between normative misperceptions and intentions to change unhealthy behaviours (Reid & Aiken, 2013). Within this younger adolescent age group, these commonly-held normative misperceptions need to be challenged in order to reduce unhealthy snacking. The findings of the current research lend support to the use of social norms feedback that reveals the actual norm to help challenge these inaccurate normative perceptions, with the aim of reducing unhealthy snacking in adolescents. Prior research has demonstrated convincing evidence for the use of a social-norms-based intervention to challenge inaccurate normative perceptions to improve personal unhealthy behaviours (Dempsey et al., 2018).

#### **4.1 Strengths and Limitations**

A strength of the current research was sampling children from areas of deprivation to understand what influences dietary behaviours, as research suggests children from these areas are more likely to engage in unhealthy eating practices which can lead to individuals having overweight or obesity (Kinra et al., 2000; Public Health England, 2020; Thomas et al., 2019). It is acknowledged even though students sampled were from schools located in socially-deprived areas (Noble et al., 2019), there could be variability within the populations'

socio-economic status (SES) and there could be other indicators of SES e.g., parental occupation. Importantly, the current study was designed in collaboration with the schools, this allowed for more a holistic understanding of the population under investigation. The schools indicated that the literacy levels amongst their parents and students were below national averages for various reasons (e.g. a proportion of families where English was not the first language). Therefore, information about a student's snacking behaviours could not be easily collected via parent-reported measures of the child's behaviour, and schools expressed that students may struggle to complete food diaries as they may have difficulty clearly documenting both food consumed and relative portion size. Although we recognise there may be limitations to collecting data using self-report questionnaires, based on feedback from the schools this was deemed the most appropriate assessment tool for this population. The questionnaire measures were tailored to students reading age and understanding and this was verified by the key contacts (who were teachers) at both schools.

The current findings are important as they present the first evidence of an association between normative misperception and unhealthy snacking behaviour of younger adolescents, although inferences cannot be made about causality. The current research focused on unhealthy snacking as this was identified by students at both schools as a common behaviour within this population; however, it is acknowledged that students could be engaging in other unhealthy behaviours (e.g. sedentary behaviour) that could contribute to the development of long-term health-comprising conditions, for example, obesity. Lastly, it should be considered that unhealthy snack foods identified as commonly consumed across the two schools may differ in other geographic locations as they may be also influenced by other factors, i.e. availability of food in school and in the local community. This makes it



difficult to make a direct comparison to the population norm owing to the complexity of unhealthy snacking and the unique measures used within this study.

## 4.2 Conclusion

The current study contributes to our understanding of normative social influences on unhealthy snacking in younger adolescents. The findings provide evidence that normative misperceptions of unhealthy snacking exist amongst 11- to 12-year-olds. These inaccurate normative perceptions are associated with increased personal unhealthy snacking consumption and a more positive personal attitude towards regular unhealthy snacking. The findings indicate that a social-norms-based intervention that provides accurate group level social norms would be a feasible strategy to help challenge commonly-held normative misperceptions of unhealthy snacking amongst younger adolescents.

### Author Contributions

[blinded for peer review: 1<sup>st</sup> author] designed the experiment in consultation with [blinded for peer review: 2<sup>nd</sup> and 3<sup>rd</sup> authors]. Data collection and analysis were performed by [blinded for peer review: 1<sup>st</sup> author]. under supervision of [blinded for peer review: 2<sup>nd</sup> and 3<sup>rd</sup> authors]. The first draft of the manuscript was written by [blinded for peer review: 1<sup>st</sup> author] and all authors commented on subsequent versions of the manuscript. All authors read and approved the final manuscript.

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Declaration of interests

None

Data availability statement

The data is not publicly available due to ethical restrictions. We do not have ethical approval for the data of participants (under 16 years of age) to be made publicly available. For this reason, our study data will not be made publicly available.

Author Accepted Version

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[Authors, Year - blinded for peer review]

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Table 1. Means and Standard Deviations of students' personal unhealthy snacking behaviour for each foodstuff.

	Mean	SD
Chocolate	3.66	5.80
Sweets	4.32	6.45
Crisps	4.98	6.55
Biscuits	4.82	7.98
Cake	2.12	5.05

Table 2. Means and Standard Deviations of males' and female's personal unhealthy snacking behaviour, related attitudes, and behavioural intention.

	Males		Females		t-tests
	Means	SD	Means	SD	
Unhealthy snacking behaviour <sup>a</sup>	22.40	24.64	16.29	16.88	2.041*
Attitude towards unhealthy snacking	5.34	1.94	5.31	1.81	.127
Attitude towards reducing unhealthy snacking	6.67	2.51	7.04	2.30	-1.046
Intention to reduce unhealthy snacking	16.81	5.58	19.16	4.90	-3.365*

<sup>a</sup> This is a sum of students' self-reported consumption of unhealthy snacks over the previous week.

\*p < .05

Table 3. Mean and Standard Deviation of personal weekly unhealthy snacking and misperceptions of peer groups' weekly unhealthy snacking.

	N <sup>a</sup>	Students' personal consumption of unhealthy snacks <sup>b</sup>		Misperception of peers' unhealthy snack consumption <sup>c</sup>		One sample Wilcoxon signed rank test <sup>d</sup>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Unhealthy snacking behaviour	205	19.15	21.05	22.27	31.38	Z = 9.667**

<sup>a</sup> Only those participants who answered both the questions about personal snacking behaviour and descriptive norm were included.

<sup>b</sup> This is a sum of students' self-reported consumption of unhealthy snacks over the previous week.

<sup>c</sup> Misperception scores were calculated by subtracting the median of personal unhealthy snacking behaviour of the group from students' normative perception (descriptive) of peers behaviour.

<sup>d</sup> One sample Wilcoxon signed rank compares misperceptions scores to a test value of zero.

\*p < .05

\*\*p < .001

Table 4. Mean and Standard Deviation of personal snacking attitudes and misperceptions of peer group snacking attitudes.

	N <sup>a</sup>	Personal snacking attitude		Misperception of peers' snacking attitudes <sup>b</sup>		One sample t-test <sup>c</sup>
		Mean	SD	Mean	SD	
Attitude towards unhealthy snacking	186	5.32	1.86	.78	1.97	$t = 5.444^{**}$
Attitude towards reducing unhealthy snacking	190	6.87	2.40	-.38	2.42	$t = -2.159^*$

<sup>a</sup> Only those participants who answered both the questions about personal attitudes and injunctive norms were included.

<sup>b</sup> Misperception scores were calculated by subtracting the median of personal snacking attitude of the group from the students' normative perception (injunctive) of peers' snacking attitudes.

<sup>c</sup> One sample t-tests compare misperception scores to a test value of zero.

\* $p < .05$

\*\* $p < .001$

Table 5. Hierarchical regression predicting students' weekly consumption of unhealthy snacks.

Variables	Block 1				Block 2			
	<i>B</i>	$\beta$	<i>SE</i>	<i>R</i> <sup>2</sup>	<i>B</i>	$\beta$	<i>SE</i>	<i>R</i> <sup>2</sup>
Block 1								
Students' sex	-3.52	-.10	2.70		-2.61	-.08	2.65	
Personal attitude towards unhealthy snacking	1.18	.13	.73	0.03	.57	.06	.76	0.09
Block 2								
Misperceptions of peers' unhealthy snack consumption <sup>a</sup>					.10	.16*	.05	
Misperceptions of peers' attitude towards unhealthy snacking <sup>b</sup>					1.59	.18*	.71	

<sup>a</sup> Misperception scores were calculated by subtracting the median of personal unhealthy snacking behaviour of the group from students' normative perception (descriptive) of peers' behaviour.

<sup>b</sup> Misperception scores were calculated by subtracting the median of personal snacking attitude of the group from the students' normative perception (injunctive) of peers' snacking attitudes.

\* $p < .05$

\*\* $p < .001$

Table 6. Hierarchical regression predicting students' personal attitude towards unhealthy snacking.

Variables	Block 1				Block 2			
	<i>B</i>	$\beta$	<i>SE</i>	<i>R</i> <sup>2</sup>	<i>B</i>	$\beta$	<i>SE</i>	<i>R</i> <sup>2</sup>
Block 1								
Students' sex	-.01	-.00	.29	.02	.01	.00	.27	.12
Personal unhealthy snacking behaviour <sup>a</sup>	.01	.13	.01		.01	.06	.01	
Block 2								
Misperceptions of peers' attitude towards unhealthy snacking <sup>a</sup>					.31	.33**	.07	

<sup>a</sup> Misperception scores were calculated by subtracting the median of personal unhealthy snacking behaviour of the group from student's normative perception (descriptive) of peers' behaviour.

<sup>b</sup> Misperception scores were calculated by subtracting the median of personal snacking attitude of the group from the student's normative perception (injunctive) of peers' snacking attitudes.

\* $p < .05$

\*\* $p < .001$



Table 7. Hierarchical regression predicting student's intention to reduce unhealthy snacking.

Variables	Block 1				Block 2			
	<i>B</i>	$\beta$	<i>SE</i>	<i>R</i> <sup>2</sup>	<i>B</i>	$\beta$	<i>SE</i>	<i>R</i> <sup>2</sup>
Block 1								
Students' sex	1.88	.18*	.76	.15	1.81	.18*	.76	.21
Personal attitude towards reducing unhealthy snacking	.68	.33**	.15		.44	.21*	.17	
Block 2								
Misperceptions of peers' unhealthy snacking behaviour <sup>a</sup>					.00	.00	.01	
Misperceptions of peers' attitude towards reducing unhealthy snacking <sup>b</sup>					.58	.27*	.17	

<sup>a</sup>This is a sum of students' self-reported consumption of unhealthy snacks over the previous week

<sup>b</sup>Misperception scores were calculated by subtracting the median of personal snacking attitude of the group from the students' normative perception (injunctive) of peers' snacking attitudes.

\* $p < .05$

\*\* $p < .001$