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REVIEW

The potential of peer social norms to shape food intake in adolescents and young adults: a systematic review of effects and moderators

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ABSTRACT

This systematic review aims to assess the role that peer social norms play in shaping young people's food intake, focusing on the important questions of *for whom* and *when* peer social norms are related to how much young people eat. Thirty-three eligible studies were reviewed (17 correlational, 16 experimental). All but one correlational studies found significant associations between norms and food intake. All experimental studies found effects of norm manipulations on food intake, and some evidence was found of behavioural spillover effects of norms. Four moderators were distilled from our literature synthesis that stipulate *for whom* and *when* peer social norms are related to food intake: identification with the norm referent group and eating-related habit strength were found to moderate the effects of social norms on food intake; forceful injunctive norms were found not to be related to food intake; and the influence of norms seemed restricted to types of foods typically consumed in the presence of peers. The findings from this literature synthesis have important implications for research, and moderators are discussed in light of psychological theory. Where applicable, potential implications for the development of social norm-based interventions to improve young people's food intake are also highlighted.

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Social norms are the behavioural standards that exist in a social group for what is considered correct and appropriate behaviour (Aronson, Wilson, & Akert, 2005), and they emerge from the shared practices and expectations of group members. In this paper we provide a systematic review of research regarding the social norms of peers pertaining to food intake as perceived by adolescents and young adults, and the association of these norms to food intake in adolescents and young adults (whom we will collectively refer to as 'young people'; the target population is further specified below). The current review aims, firstly, to investigate the role that social norms play in shaping food intake. In particular, we aim to explore the important questions of *for whom* and *when* peer social norms play a role in young people's food intake, synthesising the available evidence regarding potential moderators of the relation between peer social norms and food intake.

A focus on young people

While healthy eating is important across all age groups, young people's unhealthy eating practices in particular are a cause for concern. Numerous studies have shown that young people both eat too much unhealthy food such as high-calorie, low-nutrient-dense snacks and fast food (Bauer, Larson, Nelson, Story, & Neumark-Sztainer, 2009), and eat too little healthy food such as fruits and vegetables (Larson, Neumark-Sztainer, Hannan, & Story, 2007). Another concern regarding unhealthy food consumption in young people is that eating habits formed during adolescence and young adulthood tend to continue into adulthood and become resistant to change (Lien, Lytle, & Klepp, 2001; Lytle, Seifert, Greenstein, & McGovern, 2000), making it imperative to promote healthier eating behaviours in young people. It is therefore important to better understand what shapes young people's food intake, and to identify ways to potentially improve their eating practices.

In addition, multiple studies have shown that adolescents and young adults are more sensitive to peer influence and peer pressure than older adults across various domains such as risk taking (Gardner & Steinberg, 2005), emotionality (Pasupathi, 1999) and health behaviour (Rivis & Sheeran, 2003). From a developmental perspective, the search for a social identity and a sense of belonging to a social group are important goals for young people, more so than for older people (Erikson, 1968). As identity formation is ongoing, young people will try to fit in with their peers, live up to peer expectations and gain peer approval (Shapiro, Baumeister, & Kessler, 1991; Wooten, 2006). This heightened sensitivity to peer social influence develops early in adolescence, continues throughout adolescence and into young adulthood (Gall, Evans, & Bellerose, 2000; LaCaille, Nichols Dauner, Krambeer, & Pedersen, 2011; Steinberg & Monahan, 2007), and is lower in older adults (Steinberg & Monahan, 2007; Suls & Mullen, 1982). It has been shown that eating practices are one way through which young people attempt to establish and express their identity (Stead, McDermott, MacKintosh, & Adamson, 2011; Stok, De Ridder, Adriaanse, & De Wit, 2010), indicating that adolescents may attempt to achieve these important goals by adjusting eating-related behaviours. Young people's unhealthy eating practices, combined with their sensitivity to social influence, make for a compelling case to investigate how social norms shape food intake in this specific population.

Different types of social norms

A 'norm' is defined as a way of behaving that is considered normal, standard or typical (Collins English dictionary). Norms are contingent on the situation; being silent is the norm in a library (Aarts & Dijksterhuis, 2003), but this does not imply that one has to be silent in other environments and situations. Crucially, norms are often socially shaped. The behavioural practices and the expectations of social groups constitute social norms, outlining what would be considered acceptable behaviour of group members (Aronson et al., 2005; Cialdini, Reno, & Kallgren, 1990; Reno, Cialdini, & Kallgren, 1993). Social norms constitute an important source of influence on the individual members of social groups, affecting people's goals (Shah, 2005), experiences and behaviours (Fiske, 2010).

Social norms can stem both from what group members do themselves (i.e., the group members' practices), as well as from what group members want or prefer others in their social group to do (the group members' expectations). These two types of social norms are typically referred to as descriptive social norms and injunctive social norms, respectively (Cialdini et al., 1990; Reno et al., 1993). Descriptive social norms reflect what most group members do (e.g., 'most young people eat less than the recommended amount of fruit'), whereas injunctive social norms reflect what other group members would consider appropriate behaviour (e.g., 'most young people think their peers should eat sufficient fruit'). Thus, a descriptive norm *describes* what *is* done by most others (Cialdini et al., 1990; Reno et al., 1993). This type of social influence has been termed 'informational social influence' (Deutsch & Gerard, 1955). An injunctive norm, on the other hand, *prescribes* what most others believe *ought to be* done. This type of social influence has been termed 'normative social influence' (Deutsch & Gerard, 1955).

It is important to note that social norms are only one of multiple forms of social influence on food intake (for a recent selection of articles addressing different types of social influence on eating behaviour see, Herman, 2015). One topic in particular, which has been the focus of many previous studies, is eating in the presence of others (for reviews, see Herman & Polivy, 2005; Herman, Roth, & Polivy, 2003). While perceived norms may certainly also play a role in the effect the presence of others has on food intake, this role generally cannot be separated out from other forms of social influence such as social facilitation, modelling and impression management. Therefore, we do not include studies that investigate eating in the presence of others in our review.

Towards an understanding of moderators

Two previous reviews (Robinson, Blisset, & Higgs, 2013; Higgs, 2015) and one meta-analysis (Robinson, Thomas, Aveyard, & Higgs, 2014) suggest there is a relation between social norms and eating behaviour, with the meta-analysis also providing an indication of the size of the effect (which was judged to be 'moderate' by the authors). Together, these previous syntheses provide clear indications that social norms play a role in food intake (Robinson, Blisset, et al., 2013; Robinson, Thomas, et al., 2014) and provide an account of the (evolutionary) mechanisms explaining why human beings follow social norms related to eating (Higgs, 2015). However, the potential for social norms to improve health behaviour, including food intake, is by no means ubiquitous, with various studies also showing null effects or even negative results (for an overview, see Cameron & Campo, 2006). Due to potential publication bias, it is possible that additional unpublished studies exist that also showed no relation between social norms and food intake. Moreover, social standards surrounding food intake are often ambivalent or ambiguous (De Ridder, De Vet, Stok, Adriaanse, & De Wit, 2013; Herman & Polivy, 2013). For these reasons, it is of crucial importance to better understand for whom and when peer social norms are effective in changing food intake, and, consequently, also to gain more insight into *for whom* and *when* peer social norms are *not* effective tools to changing food intake.

The current review adds to the existing body of knowledge by exploring these important questions in a more detailed, systematic and comprehensive manner than has been done to date, by tying moderators to psychological theory, and by highlighting implications of the identified moderators for health-promotion practice. We synthesise the available evidence on potential moderators of the relation between social norms and food intake from both experimental and correlational studies, and from studies on both descriptive and injunctive eating-related norms. With *moderators* we refer to any factor (e.g., a dispositional individual trait, a property of the norm message, an aspect of the context or situation) that may interact with the perceived social norm to shape food intake, and that may help delineate *for whom* and *when* social norms affect food intake. Our inclusive approach expands previous reviews in which correlational studies and studies investigating injunctive norms have received relatively less attention. By presenting a theory-driven account of both social norm effects and moderators of social norm effects on food intake, we aim to increase understanding of the mechanisms underlying the influence of social norms on young people's food intake, and facilitate the generation of new hypotheses for research.

Methods

We included in this systematic review correlational and experimental studies assessing the relation between peer social norms (either descriptive or injunctive norms) and young people's food intake. Food intake in this review encompasses young people's (intended) intake of any type of food or any type of non-alcoholic drink. The review thus focuses on *how much* young people eat, rather than on *what* they choose to eat (i.e., food selection). Following contemporary perspectives on psychological and social development, the category of 'young people' includes early, middle and late adolescents (Steinberg, 2011) and young or 'emerging' adults (Arnett, 2010); the

corresponding age range was defined as ranging from 10 to 25 years of age (Arnett, 2010; Steinberg, 2008, 2011). Both adolescence and young adulthood are considered critical transitional life phases (Coleman, 2011; Gall et al., 2000), in which people are establishing their social identity and in which sensitivity to social norms is heightened (Gall et al., 2000; LaCaille et al., 2011).

Searches for relevant research that had been published up to July 2015 were carried out in two databases: PsycInfo and Web of Science. We formulated a comprehensive string of search terms that included both social norm-related keywords and keywords related to dietary intake. For dietary intake we included both general terms (e.g., eating) as well as specific terms corresponding to the types of food that are most often investigated in research with young people (e.g., snack). The complete string of search terms was ('norm' or 'norms' or 'social norm*' or 'eating norm*' or 'descriptive norm*' or 'injunctive norm*' or 'subjective norm*' AND 'eating' or 'food*' or 'snack*' or 'fruit*' or 'vegetable*' or 'soft drink*' or 'sugar-sweetened'). The search was restricted such that the search terms should be present in an article's title, abstract or identifiers in PsycInfo, and in the article's topic in Web of Science. We chose not to include terms indicating peer norms specifically, nor age group identifiers, because this could inadvertently constrict the searches. Instead, we assessed whether the papers we identified fit our inclusion criteria. No restrictions were imposed regarding year of publication. See Appendix A1 in the Supplemental Online Material for detailed inclusion criteria.

The searches yielded 1155 (PsycInfo) and 2489 (Web of Science) papers. After deduplication of hits and screening the titles and abstracts of the remaining unique hits, 47 papers remained. After full reading of these remaining papers, 19 papers were included in our review. The reference lists of these 19 papers were screened for additional relevant studies, as were the reference lists of five recent (umbrella) reviews investigating determinants in general of young people's food intake (McClain, Chappuis, Nguyen-Rodriguez, Yaroch, & Spruijt-Metz, 2009; Rasmussen et al., 2006; Sled-dens et al., 2015; Van Der Horst et al., 2007; Verloigne, Van Lippenvelde, Maes, Brug, & De Bourdeaud-huij, 2012). This resulted in the identification of a further 10 papers that met our inclusion criteria. In all, our systematic search yielded 29 papers reporting 33 eligible empirical studies of the relation between social norms and young people's food intake. Seventeen of these were correlational studies of associations between social norms and dietary intake (studies #1–17, see Appendix A2 in the Supplemental Online Material), and 16 were experimental studies that intervened on social norm perceptions (studies #18–33, see Appendix A3 in the Supplemental Online Material). Detailed information on, and the results of, our quality assessment of the studies are provided in Appendix A4 in the Supplemental Online Material.

The included studies represent a substantially heterogeneous body of research that differed in multiple ways, including with respect to the types of norms that were investigated; the specific social norm measures or manipulations that were employed; whether norms were concerned with healthy or unhealthy food intake; the type of outcome variables that were assessed; the method of assessment of outcome variables; and the moderator variables that were assessed. Moreover, for each potential moderator variable identified, either only few studies testing it were available or the moderator was newly identified from our synthesis and had thus not yet been empirically tested, precluding the possibility to conduct valid quantitative analysis of their effects. In order to synthesise this heterogeneous, and in some cases limited, set of studies in such a way that useful insights about the body of research as a whole could be distilled, the form of a narrative systematic review was chosen. In view of the current state of research, we believe that this approach will provide most insight into the role that social norms play in shaping young people's eating behaviour and the moderators of this relation, thus providing the largest contribution to the advancement of both theory and practice.

Results

Seventeen correlational studies assessed young people's perception of peer social norms and examined associations of these perceived norms with food intake (studies #1–17; study details are

provided in Appendix A2 in the Supplemental Online Material). Sixteen of these 17 studies showed a significant association between peer social norms and young people's food intake. Associations were found across differing operationalizations of social norms (descriptive, injunctive or a combination of descriptive and injunctive; norms related to healthy and unhealthy eating), across different specific peer group referred to (e.g., best or close friends, best friends at school or university, friends in general, peers, peers from the same grade or peers from the same university), and across different outcome measures (intention or behaviour; healthy or unhealthy eating; food intake measured

Table 1. Findings of correlational studies.

#	Reference	Narrative summary of reported results
1	Lally, Bartle, and Wardle (2011)	The descriptive norms were positively associated with consumption of fruits and vegetables (combined measure), soft drinks, and unhealthy snacks
2	Perkins, Perkins, and Craig (2010)	The descriptive norm was positively associated with consumption of sugar-sweetened beverages
3	De Bourdeaudhuij and Van Oost (2000)	The descriptive norms were positively associated with consumption of fruits. The descriptive norms were not associated with consumption of vegetables, soft drinks, unhealthy snacks, and fat
4	Woodward et al. (1996)	The descriptive norms were positively associated with consumption of fruits and vegetables (combined measure), soft drinks, and unhealthy snacks. The descriptive norms were not associated with consumption of meats, dairy and spreads
5	Nordrehaug Åstrøm and Rise (2001)	The descriptive norm was positively associated with healthy eating intentions, but only in respondents strongly identifying with the norm referent group
6	Grimm, Harnack, and Story (2004)	The descriptive norm was positively associated with consumption of soft drinks
7	Van Der Horst et al. (2008)	The descriptive norms were positively associated with consumption of soft drinks and unhealthy snacks
8	Vereecken, Van Damme, and Maes (2005)	The descriptive norms were positively associated with consumption of fruits and vegetables (measured separately)
9	Louis, Davies, Smith, and Terry (2007)	The descriptive norm was positively associated with healthy eating intentions, but only in respondents strongly identifying with the norm referent group. No relation between the descriptive norm and self-reported actual consumption during two subsequent weeks was observed
10	Pelletier, Graham, and Laska (2014)	The descriptive norms were positively associated with consumption of fruits and vegetables (combined measure), sugar-sweetened beverages, fast food, and the frequency of preparing meals at home. These associations were not moderated by living arrangement
11	Stok, De Vet, De Wit, Luszczynska, et al. (2015)	Both the pro-healthy injunctive norm and the anti-unhealthy injunctive norm were positively associated with healthy eating intentions. Only the pro-healthy injunctive norm was associated with healthy intake (positively) and unhealthy intake (negatively), while the anti-unhealthy injunctive norm was not associated with either intake measure
12	Weber Cullen et al. (2001)	The composite descriptive norm and the composite injunctive norm were both not associated with consumption of fruit, juice and vegetables (combined measure)
13	Yun and Silk (2011)	The descriptive norm was positively associated with healthy eating intentions, but only when the norm referent group was a group of close friends. When the norm referent group was a group of more distal peers, there was no such association. The injunctive norm was positively associated with healthy eating intentions regardless of whether the norm referent group consisted of close friends or more distal peers
14	Pedersen et al. (2015)	The descriptive norm was positively associated with consumption of fruits and vegetables (combined measures), while the injunctive norm was negatively associated with consumption of fruits and vegetables
15	Wood Baker, Little, and Brownell (2003)	The combined descriptive/injunctive norm was indirectly (through attitude) positively associated with healthy eating intentions and actual healthy eating
16	Thompson, Bachman, Watson, Baranowski, and Weber Cullen (2007)	The combined descriptive/injunctive norm was positively associated with consumption of low-fat milk and total milk consumption, and negatively associated with soft drink consumption
17	Thompson, Bachman, Baranowski, and Weber Cullen (2007)	The descriptive norm was positively associated with consumption of fruits and vegetables (measured separately)

with food record forms, food frequency questionnaires, self-reported average daily consumption or self-reported frequency of consumption). For detailed results of the correlational studies, see [Table 1](#).

Sixteen experimental studies evaluated the effect of manipulating young people's perceived peer social norms on their food intake (studies #18–33; study details are provided in Appendix A3 in the Supplemental Online Material). All 16 studies investigating the influence of peer social norm manipulations on food intake found (at least some) significant effects. Each of these studies included a descriptive norm manipulation, and across all 16 studies the results consistently showed that changing young people's perceptions of *descriptive* peer social norms can change their food intake. Effects of peer social norm manipulations were found across two quite distinct types of descriptive norm manipulations: the explicit communication of social norms via a written message or poster and the implicit communication of social norms via an environmental cue. Two experimental studies (#24–25) additionally included an *injunctive* social norm manipulation. Both these studies found that manipulating injunctive peer norms did not significantly affect young people's food intake. For detailed results of the experimental studies, see [Table 2](#).

An interesting issue that emerged from the synthesis of studies is the question whether a social norm that is related to one specific food type could be associated with (or, in case of an experimental manipulation, spill over to affect) intake of other food types. One correlational study (#16) found that a descriptive norm regarding a healthy drink (low-fat milk) was not only associated with higher intake of the targeted food type, but also with a lower intake of an unhealthy alternative food type (soft drinks). Of two experimental studies that tested the presence of a spillover effect, one found that a manipulation of a descriptive norm discouraging unhealthy snacking did not spill over to increase intake of healthy alternatives such as fruits and vegetables (#21). Another experimental study however did find that a manipulation of a descriptive norm encouraging fruit and vegetable intake also reduced high-calorie snack intake and total calorie consumption (#24).

For whom and when do social norms play a role in food intake: moderators

Across the 33 synthesised reviewed studies, evidence emerged for four potential moderators regarding *for whom* and *when* social norms may shape young people's food intake. This information is included in the description of results in [Tables 1](#) and [2](#), and is briefly summarised here.

Various studies have investigated the moderating effect of the strength of *identification with the norm referent group* (or social proximity to the norm referent group). Three correlational studies found that descriptive social norms were only related to young people's intentions to eat healthily when the participants strongly identified with the norm referent group (#5, #9) or when the referent group was a (close) group of friends rather than a (more distant) group of students from the same university (#13). Further, three experimental studies found that descriptive norms only affected (intended) fruit or vegetable intake when participants strongly identified with the norm referent group (#18, #22) or when the descriptive norm ostensibly stemmed from a closer (fellow students) rather than a more distant (people in general) referent group (#19). One study (#13) investigated the importance of identification with the norm referent group with respect to the effect of injunctive norms and found that social proximity of the referent group did not affect the association of injunctive norms with healthy eating intentions.

Three experimental studies investigated whether *habit strength* moderates the relation between social norms and food intake. Two studies (#20, #24) showed that descriptive social norm manipulations promoting healthy eating may have a stronger effect on young people's healthy food intake when their usual or habitual healthy consumption is low. Another study (#21), investigating a descriptive social norm manipulation that discouraged unhealthy eating, found no moderating effect of usual unhealthy food intake.

Synthesis of the correlational studies, in particular, showed that peer social norms were not associated with intake of all foods and a further moderator of the relation between social norms (both descriptive and injunctive) and food intake may be related to the type of food referenced in the

Table 2. Findings of experimental studies.

#	Reference	Narrative summary of reported results
18	Stok, De Ridder, De Vet, and De Wit (2012) (Study 1)	The descriptive norm increased fruit intake intentions compared to the descriptive minority norm, but only in participants strongly identifying with the norm referent group
19	Stok et al. (2012) (Study 2)	The descriptive norm increased fruit consumption compared to the descriptive minority norm and (marginally significantly) compared to a no-norm control condition, but only when the norm referent group was one with which participants strongly identified
20	Robinson, Fleming, and Higgs (2014) (Study 1)	The descriptive norm increased vegetable consumption compared to a control message, but only in participants with low habitual vegetable consumption. No effect was observed on total calorie consumption
21	Robinson, Harris, Thomas, Aveyard, and Higgs (2013)	The descriptive norm decreased unhealthy snack consumption and total calorie consumption compared to a no-norm control condition, but did not affect consumption of healthy alternatives (e.g., vegetables). No moderation effect of habitual junk food consumption was observed
22	Stok, Verkooijen, De Ridder, De Wit, and De Vet (2014) (Study 1)	The descriptive norm increased vegetable consumption compared to the descriptive minority norm, but only in participants strongly identifying with the norm referent group
23	Stok, Verkooijen, et al. (2014) (Study 2)	The descriptive norm increased vegetable intake intentions compared to the descriptive minority norm
24	Robinson, Fleming, et al. (2014) (Study 2)	The descriptive norm increased consumption of fruits and vegetables compared to the injunctive norm and compared to a no-norm control condition. The descriptive norm decreased consumption of unhealthy snacks and total calorie consumption as compared to the no-norm control condition, but no such differences were observed compared to the injunctive norm condition. Effects were only present in participants with low habitual fruit and vegetable consumption
25	Stok, De Ridder, De Vet, and De Wit (2014)	The descriptive norm did not increase fruit intake intentions compared to a no-norm control condition, while the injunctive norm lowered intentions compared to the descriptive norm and compared to the no-norm control condition. The descriptive norm increased fruit consumption compared to the injunctive norm condition and (marginally significantly) compared to the no-norm control condition. Fruit consumption did not differ between the injunctive norm and the no-norm control condition
26	Feeney, Polivy, Pliner, and Sullivan (2011)	The descriptive inhibition norm decreased consumption compared to a no-norm control condition
27	Pliner and Mann (2004) (Study 1)	The descriptive augmentation norm increased consumption compared to the descriptive inhibition norm and compared to a no-norm control condition, but only for palatable cookies. There was no difference between the descriptive inhibition norm and the no-norm control condition. No effects were found for the number of cookies selected to take home for further testing
28	Prinsen, De Ridder, and De Vet (2013) (Study 2)	The descriptive augmentation norm increased consumption compared to the descriptive inhibition norm
29	Roth, Herman, Polivy, and Pliner (2001)	The descriptive augmentation norm increased consumption compared to the descriptive inhibition norm and compared to a no-norm control condition. There was no difference between the descriptive inhibition norm and the no-norm control condition
30	Robinson, Benwell, and Higgs (2013)	The descriptive augmentation norm increased consumption compared to the descriptive inhibition norm and compared to a no-norm control condition. The descriptive inhibition norm decreased consumption compared to the no-norm control condition
31	Robinson, Sharps, et al. (2014)	The descriptive augmentation norm increased consumption compared to the descriptive inhibition norm. There was no moderation of weight status of the norm referent group
32	Vartanian, Sokol, Herman, and Polivy (2013) (Study 1)	The descriptive inhibition norm decreased consumption compared to the descriptive augmentation norm and compared to a no-norm control condition. There was no difference between the descriptive augmentation norm and the no-norm control condition
33	Vartanian et al. (2013) (Study 2)	The descriptive inhibition norm decreased consumption compared to the descriptive augmentation norm and compared to a no-norm control condition. There was no difference between the descriptive augmentation norm and the no-norm control condition

social norm. It should be noted that this is a newly identified potential moderator, which has not been tested empirically yet. While peer social norms were consistently associated with the intake of foods that are typically consumed in situations in which peers are present (such as snacks and soft drinks,

which also frequently coincides with consumption outside of the home and family context), evidence for an association between peer social norms and food intake was much less consistent for foods less likely to be consumed with peers (such as vegetables or meats, which are mostly part of formal meals likely to be consumed in the home and family context). For example, one study (#4) showed that peer social norms were associated with consumption of fruits and snacks but not with consumption of meat and dairy, and another study (#3) showed that peer social norms were associated with consumption of fruit, but not with consumption of fat (as a percentage of total intake) and vegetables. Similarly, the evidence for an association between peer social norms and vegetable intake (when considered separately from fruit intake) was inconsistent in adolescents (#1, #3, #4, #8, #12). Underscoring the importance of social context, studies investigating consumption of vegetables during lunchtime at school or in a college cafeteria, that is, in the presence of peers, found that vegetable intake was consistently related to (manipulations of) peer social norms (#10, #17, #20, #21, #24).

For injunctive norms, the forcefulness with which the norm is communicated may also act as a moderator of the association between social norms and young people's food intake. A number of correlational studies (#11, #13, #15–17) found that injunctive peer norms (or a combination of injunctive and descriptive peer norms) were positively associated with food intake. However, one correlational (#14) and two experimental (#24, #25) studies found that measures or manipulations of injunctive norms were not related to food intake, or even had a detrimental effect (i.e., conflicting with the intended health-promotion effect) on food intake. An important difference between these two sets of studies lies in the forcefulness of the (communicated) injunctive norm. In the former studies, the operant in the injunctive norm measure was always a verb like 'suggest', 'encourage' or 'endorse' and the injunctive norm measure would, for example, read 'my peers *suggest* that I eat more healthily'. In the latter studies, in contrast, the operant in the injunctive norm measure or manipulation was a more insisting verb, for example, peers asserting that 'you *should* eat more healthily'. This difference between a suggestion, or '*might* message', and a prescription, or '*ought* message', may moderate the extent to which injunctive norms influence food intake in the desired, healthy direction. This potential moderator, too, has been newly identified from this research synthesis and has not yet been tested empirically.

Discussion

With 32 out of 33 studies, both correlational and experimental, showing evidence of a relation between peer social norms and young people's food intake, this systematic research synthesis corroborates conclusions of previous reviews that social norms can play a role in young people's food intake (Higgs, 2015; Robinson, Blisset, et al., 2013; Robinson, Thomas, et al., 2014). Our quality assessments indicated that the studies were in general of good quality. There were no indications in our review that effects of social norms on food intake differed between adolescents and young adults. The conclusion that peer social norms hold potential as a tool for improving young people's food intake thus seems warranted.

One issue that arose from our synthesis of studies was that the role of a social norm targeting a specific food type may shape not only intake of that specific food type, but may also spill over to other food types. Spillover effects are important to understand because of their potential to increase the impact of health-promotion interventions, including social norm interventions. If an intervention promoting consumption of fruits via a social norm intervention not only increases fruit consumption but, at the same time, also decreases unhealthy snack consumption, the intervention in fact provides a two-for-one yield on investment. Evidence for spillover effects at the moment are inconsistent: of only three studies investigating such effects, two found evidence of the existence of spillover effects. The spillover effects found in our review did not appear random; rather, they seem to be indicative of replacement of one food type with another. For example, a social norm message aimed at increasing intake of milk was effective not only in increasing consumption of that product, but also resulted in decreased consumption of soft drinks. While behavioural spillover effects have been described

previously, for example regarding pro-environmental behaviour (Cason, Savikhin, & Sheremeta, 2012; Lanzini & Thøgersen, 2014), they have not yet received much attention in the domain of social norm interventions. We suggest that spillover effects of social norm interventions are one of the important avenues for future research.

Crucially, and expanding on previous reviews of research into the relation between social norms and food intake, our research synthesis clearly indicated that social norms are by no means always related to food intake. Several important moderators or potential moderators were identified that should be taken into account when considering the influence of peer social norms on young people's food intake. This is in line with previous findings that the effects of social norm interventions on health behaviour are far from consistent (Cameron & Campo, 2006). It is likely that this seeming inconsistency across studies reflects the role of moderators of the relation between social norm messages and health behaviour that are not yet well understood. While social norm interventions hold great potential as a tool for the improvement of young people's food intake, and might also be used to promote other health behaviours in young people and other target populations, care must be taken to deliver social norm interventions in the right way, to the right individuals, and in the right circumstances. In the following section, we will relate evidence regarding potential moderators distilled from our research synthesis to psychological theory and highlight implications for research and, where applicable, for practice.

Moderators: for whom and when do social norms play a role in shaping food intake?

Identification with the norm referent group was shown to be a moderator of the relation between descriptive norms and young people's food intake in three observational and three experimental studies. Descriptive norms provide so-called *consensus information* (Thibaut & Kelley, 1959), indicating the typical way to behave for members of a certain social group. Such consensus information would only motivate people to behave in a particular way when they feel part of the social group or aspire to become part of it. When one does not identify with the group, it would be irrelevant to adhere to that group's standards. It is important to note that similar effects of social norms have been observed regardless of whether the norm referent group consisted of a group of friends (to whom one may be more socially close) or a group of (more socially distant) peers, such as classmates or students from the same university. This suggests that it is mainly important that the referent group is one with which the targeted individual can identify. For injunctive norms, a moderating effect of identification with the norm referent group was not observed, although this potential moderating effect was investigated in only one study included in this review and this study only looked at eating intentions as an outcome variable. Future research should further investigate how identification with the norm referent group may moderate the effect of injunctive norm messages on young people's food intake.

Habitual consumption of specific food types was also identified as a moderator of the relation between social norms and young people's food intake. Two experimental studies suggest that effects of social norm interventions on *healthy* eating are most likely to occur for those young people who do not yet have a strong habit regarding the consumption of healthy products, and who thus stand most to gain from such interventions. One experimental study showed that the effects of a social norm message aimed at decreasing *unhealthy* eating was *not* mitigated by habit strength, suggesting that such interventions are beneficial also to those with a stronger habit of eating unhealthy foods.

As habits have been shown to be a major determinant of unhealthy snacking behaviour (Verhoeven, Adriaanse, Evers, & de Ridder, 2012), it is promising that this review finds that social norm messages can be effective at decreasing unhealthy food intake also in young people who have stronger unhealthy eating habits. However, to date only three studies have addressed this moderator, and future research needs to further assess if and how habits may moderate the effect of social norm messages on young people's food intake, as well as to exclude potential alternative explanations

such as regression to the mean (cf. Verkooijen, Stok, & Mollen, 2015). One interesting implication to consider is how social norm interventions might be used to break unhealthy habits. Descriptive norm messages in particular are thought to exert their influence via relatively unaware, automatic processes (Jacobson, Mortensen, & Cialdini, 2011), and as habits are thought to primarily affect behaviour automatically (e.g., Orbell & Verplanken, 2010, 2015), it seems theoretically sound that descriptive norm messages could be particularly suitable interventions to 'break' unhealthy eating habits (for a similar argumentation regarding the automatic influence of interventions aiming to change health-protective and health-risk peer *prototypes*, that is, peer social images, see Todd, Kothe, Mullan, & Monds, 2016; Van Lettow, De Vries, Burdorf, & Van Empelen, 2016).

The *type of food addressed in the social norm* may also act as moderator of the relation between social norms and food intake in young people. Our synthesis of evidence indicates that the efficacy of peer social norms may be restricted to those types of food that are typically consumed in situations (e.g., snacks, fruits and soft drinks). This is consistent with the focus theory of normative conduct (Cialdini et al., 1990) which posits that, because various (and potentially conflicting) norms typically exist at the same time, any single norm will influence behaviour only in situations that activate that specific norm. In other words; situations that are associated with peers are more likely to activate peer norms, while other social contexts (most notably the home situation, in the company of parents and family) may more likely activate family or parental social norms (cf. Pedersen, Grønhøj, & Thøgersen, 2015). Consideration of this potential moderator may help explain previously conflicting findings regarding the role and influential power of parents or peers in shaping young people's eating behaviour, with some studies finding a larger role for parents and some studies finding a larger role for peers. Regarding health-promotion practice, this finding suggests that a good understanding of eating contexts within each target group is essential for the development of effective social norm interventions. This moderator is newly identified from considering together twelve different studies (both observational and experimental) included in this review, and has thus not yet been tested empirically; doing so would be an important avenue for future research.

Forcefulness of the social norm also emerged from the research synthesis as an important potential moderator of the relation between injunctive norms and food intake. Specifically, injunctive norm measures or manipulations that contained a strong 'ought' message were shown not be related to food intake (and in one case even adversely affected intended fruit intake), while injunctive norm measures or manipulations that contained a more subtle 'might' message were positively related to healthier (intended) food intake. Injunctive norms that are communicated too strongly or that are too obviously aimed at improving health behaviour may thus be construed by young people as attempts to restrict their freedom, which may induce reactance (Brehm, 1966; Clee & Wicklund, 1980), possibly even leading to boomerang effects.

Resistance to influence attempts that are experienced as too strong or too obvious has been shown for other health behaviour change strategies, for example persuasive communication, financial incentives and choice-related nudges (Adams, Giles, McColl, & Sniehotta, 2014; Arad & Rubinstein, 2015; Rains, 2013). Adolescents and young adults are generally considered to be especially sensitive to what they consider intrusions regarding their decisional freedom, and are therefore also thought to be particularly prone to feelings of psychological reactance (Burgoon, Alvaro, Grandpre, & Voulodakis, 2002; Miller, Lane, Deatrick, Young, & Potts, 2007). In developing social norm interventions it therefore seems prudent to keep in mind that injunctive norm messages may not always lead to the desired effect in adolescents, and that norm messages are best presented in a subtle manner. Recent research (Stok, De Vet, De Wit, Renner, & De Ridder, 2015) provides corroborating evidence for a potential boundary effect of the forcefulness of injunctive norm messages on food intake by showing that phrasing a norm as a suggestion ('it is better not to eat'), rather than a prescription ('you are not allowed to eat'), resulted in less (compensatory) unhealthy eating once the restriction on consumption was lifted. Importantly, forcefulness of the norm message is expected to only

affect the influence of injunctive norms, as descriptive norm messages merely describe other people's behaviour and therefore should not induce a feeling of being steered in a certain direction.

This moderator, too, emerged from this research synthesis (specifically, from the consideration of eight observational and experimental studies) as a newly identified potential moderator, and has not been tested empirically in the studies included in this review. It should be noted that another distinction between the studies using a 'might' message and the studies using an 'ought' message is that the former were observational studies, while the latter consisted of two experimental and one observational studies. An alternative explanation for the obtained differences in efficacy could therefore be the type of study, in the sense that observational studies are more likely to show evidence of an association between an injunctive norm and food intake than experimental studies. The fact that the current body of evidence does include one observational study using an 'ought' message, which was found not to be associated with food intake, speaks against this alternative explanation. Moreover, a recent experimental study that was not included in the current review (Stok, De Vet, De Wit, Renner, & De Ridder, 2015) and that investigated both an 'ought' and a 'might' message provided further corroborating evidence. However, it is clear that additional research (with experimental studies using 'might' messages and with observational studies using 'ought' messages) is needed to provide more conclusive evidence on this issue.

Limitations and avenues for future research

The current review has several limitations. Importantly, we only included published studies and due to publication bias we may have failed to identify and hence excluded studies that did not find a relation between social norms and food intake (Rothstein, Sutton, & Borenstein, 2005). Nevertheless, as 32 out of 33 studies found a significant association between social norm measures or manipulations and young people's food intake we feel that this systematic review and evidence synthesis makes a convincing case that social norms play at least some role in young people's food intake. Moreover, some of the potentially relevant moderators were only investigated in few studies, or newly emerged from the research synthesis and have thus not yet been tested empirically, preventing the ability to draw strong conclusions. We have attempted to clearly indicate the extent of evidence underpinning the conclusions and re-iterate that more research is needed to provide more comprehensive understanding of how peer social norms are associated with and may influence young people's food intake.

In addition, the current review only included studies investigating effects of social norms on young people's food *intake* (that is, how much food is consumed). Few studies have investigated effects of social norms on food *selection* (that is, which foods are consumed), and results have been more inconsistent with regard to this outcome. Some studies (e.g., Mollen, Rimal, Ruiters, & Kok, 2013) found similar effects of social norms on food selection as we have reported in this review for food intake, but other studies (e.g., Pliner & Mann, 2004) found that social norms did not affect food selection decisions. Pliner and Mann (2004) suggested that choosing which foods to eat reflects a judgment about preferences, which can be considered a more absolute and personal judgment, while decisions about how much to consume of any given type of food are more ambiguous and less reflective of personal truths (Crutchfield, 1955). Future research could investigate to what extent the effects of social norms on food intake, as described in the current review, are generalisable to other eating-related outcomes, notably food selection processes.

An important issue and further potential limitation of our review to consider is the role of age in associations between social norms and young people's food intake. Based on recent developmental perspectives of adolescence (Arnett, 2010; Steinberg, 2011), we included in this review studies with adolescents as well as young adults, with participants' mean age across studies ranging from 10 to 25 years. This wide age range, from pre- and early-adolescence through to late adolescence and early adulthood, encompasses various developmentally very distinct periods (Arnett, 2010). However, we considered this broad age range as a strength of our review, as it enabled an encompassing

and comprehensive synthesis of research in different age groups regarding the relation between social norms and young people's food intake. Furthermore, the findings of this review do not suggest that there are important differences across this broad age range with regard to the relation between social norms and food intake; similar associations and effects were found in studies with samples of young people that differed in mean age. This is consistent with findings from other domains showing that sensitivity to peer influence is heightened in adolescence and remains high into early adulthood, compared to older adulthood (Gardner & Steinberg, 2005; Rivas & Sheeran, 2003; Pasupathi, 1999). Importantly, we do not expect that peer social norms have a qualitatively different effect on older adults, nor do we believe that the moderators are not applicable to older populations. Rather, we expect that social norms simply play a somewhat smaller role in shaping food intake in older people, in whom eating practices are likely more established and stable.

Conclusions

While a substantial body of research has investigated the association of social norms with young people's food intake, this is a broad and heterogeneous domain, comprising research from different disciplines using widely differing approaches to conceptualise, operationalise and measure social norms. This heterogeneity has made it difficult to determine if peer social norms are related to young people's food intake and, even more importantly, to increase understanding regarding *for whom* and *when* social norms play a role in young people's food intake. In this systematic review we therefore set out to synthesise the research investigating the relation between peer social norms and young people's food intake and to identify potential moderators of this relation. Insights gathered through this review can be used to better tailor future social norms interventions, and to help shape future research that further investigates the moderators we identified. This should contribute to increasing understanding of how and when peer social norms can affect in young people's food intake.

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