

Social Norms: Can We Use Them to Promote Healthy Eating?

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**MSc Thesis Health and Society
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HSO-80333

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March, 2016

Abstract

Social norms exert enormous influence on our behaviour. Social norms can be divided in descriptive and injunctive norms. Descriptive norms refer to what is commonly done and injunctive norms refer to what is commonly approved or disapproved. Uncertainty exists about the usefulness of these norms to create interventions to promote healthy eating. Therefore, the aim of this research was to assess the effect of descriptive, injunctive and a combination of both norms on students' fruit consumption. In addition, the possible moderating effects of the need to belong, impulsivity and gender were assessed. It was expected that exposure to any type of norm would result in more fruit consumption than exposure to no norm. Therefore, 265 students were exposed to a descriptive norm, an injunctive norm, a combination of both norms or no norm that promoted fruit intake. Results showed no effect of any type of norm on the choice between fruit or an unhealthy snack as reward for participation, nor on three-day fruit consumption which was measured with online diaries. The strength of a person's need to belong, impulsivity or gender did not impact these results. More research is therefore needed to discover the ingredients for effective interventions targeting eating behaviour with social norms.

Keywords: social norm intervention; descriptive norm; injunctive norm; eating behaviour; fruit consumption; need to belong; impulsivity; gender

Table of contents

Abstract	ii
Table of contents	iii
Introduction	1
Norms and eating behaviour	1
The need to belong	4
Impulsivity	5
Gender	6
The present study	7
Method	8
Participants online baseline questionnaire	8
Participants follow-up online fruit diary	8
Materials and procedure	9
Data preparation	11
Statistical analyses.....	11
Participant characteristics	11
Social norms and fruit consumption	12
Results	13
Participant characteristics online baseline questionnaire	13
Participant characteristics follow-up online diaries	14
Social norms and fruit consumption.....	15
Discussion	17
Limitations	18
Conclusion.....	20
References	21

Introduction

Both developed countries and newly developed countries have witnessed a rapid change in dietary and lifestyle patterns during the last two decades, giving rise to an increasing prevalence in chronic illnesses such as obesity, diabetes mellitus, cardiovascular disease, hypertension, stroke and certain types of cancer (WHO, 2002). The costs associated with these chronic illnesses place an enormous burden on health care systems around the world (Nishida, Shetty, & Uauy, 2004). Therefore, numerous programmes and campaigns have sought to change people's current eating practices into a more healthy and balanced diet. For example, The Netherlands Nutrition Centre Foundation has established multiple programmes with the aim to provide information on, and to encourage consumers to make, healthier and more sustainable food choices (Stichting Voedingscentrum Nederland, n.d.).

Because eating patterns have been found to spread through social networks, it has been suggested that social factors may contribute to their existence (Christakis & Fowler, 2007; Pachucki, Jacques, & Christakis, 2011). Indeed, one such factor, social eating norms, has been found to determine eating practices (Robinson, Thomas, Aveyard, & Higgs, 2014). Therefore, new initiatives to promote healthier diets could possibly benefit from using the so-called social norms approach, which provides information about the prevalence and approval of certain behaviours with the aim to persuade individuals to perform that behaviour (Yun & Silk, 2011).

Norms and eating behaviour

According to Cialdini, Reno, and Kallgren (1990) it is useful to distinguish between two kinds of social norms, each referring to a different source of human motivation: descriptive norms, also known as informational norms (Robinson, Thomas, et al., 2014), refer to what is commonly done. Injunctive norms, on the other hand, refer to what is commonly approved or disapproved. Cialdini et al. (1990) argue that registering and imitating other actions, thus using descriptive norms, offers an information-processing advantage and a decisional shortcut. By contrast, the acting upon rules or beliefs about what constitutes morally (dis)approved conduct, thus using injunctive norms, is thought to be governed by the promise of social sanctions. The distinctive ability of descriptive and injunctive norms to predict behaviour was demonstrated by Park and Smith (2007), who found that the ability of descriptive norms to predict the intention of signing an organ donation registry and talking with family about organ donation differed from the ability of injunctive norms to predict the intentions of engaging in these behaviours critical to organ donation.

Many studies have sought to examine the effect of descriptive norms on eating behaviour. In these studies, eating behaviour of participants in the presence of others is observed. A common finding in these studies is that participants tend to consume similar amounts and similar types of food as that of their eating partners (e.g. Feeney, Polivy, Pliner, & Sullivan, 2011; Herman, Koenig-Nobert, Peterson, & Polivy, 2005; Hermans, Larsen, Herman, & Engels, 2009; Robinson & Higgs, 2013). This effect is so strong that Goldman, Herman, and Polivy (1991) even found participants with deprivation-induced hunger to consume less in the presence of a model who consumed very little than in the presence of a model who consumed a lot.

Next to studies that have examined the effect of descriptive norms on eating behaviour in the presence of others, called live-model designs, are studies that have examined the effect of descriptive norms on eating behaviour when only informed about the (mostly fictional) amount and types of food consumed by others, called remote confederate designs. Results of studies using these remote confederate designs have not been as univocal as studies using live models. While some studies did find the use of descriptive norms affecting eating behaviour (Feeney et al., 2011; Robinson, Benwell, & Higgs, 2013; Prinsen, de Ridder, & de Vet, 2013), others have found only limited (Pliner & Mann, 2004; Roth, Herman, Polivy, & Pliner, 2001; Burger, Bell, Harvey, Johnson, Stewart, Dorian, & Swedroe, 2010; Robinson, Fleming, & Higgs, 2014) or even no (Verkooijen, Stok, & Mollen, 2015) support for the effect. However, many of the studies that did not find total support for the notion that descriptive norms affect eating behaviour point to methodological limitations as a cause for this. For example, Pliner and Mann (2004) note that participants in the control condition consumed so few cookies that it was hard for the participants subjected to the descriptive norm, which communicated to consume few cookies, to inhibit their eating. Moreover, Feeney et al. (2011) compared the effects of the live model and remote confederate designs on the amount of food consumed and did not find a significant difference between the designs on their effect on eating behaviour. In sum, it is not surprising that Robinson, Thomas, et al. (2014), in their meta-analysis on the effect of descriptive norms on eating behaviour, conclude that descriptive norms influence the choice and amount of eaten food in both live model and remote confederate designs.

Although it can thus be concluded that seeing or inferring the eating behaviour of others (descriptive norms) affects our own eating behaviour, less is known about the effect of knowing or hearing about what behaviour others approve of (injunctive norms) on eating behaviour. Injunctive norms have been found to predict multiple behaviours like drinking, gambling and substance abuse (Borsari & Carey, 2003; Larimer & Neighbors, 2003; Elek,

Miller-Day, & Hecht, 2006). However, Lally, Bartle, and Wardle (2011) did not find a significant association between perceived injunctive norms and intake of fruit and vegetables, sugar-sweetened drinks and unhealthy snacks among adolescents, although perceived descriptive norms were found to be associated with these eating behaviours.

In one of the few experimental studies testing the effect of injunctive norms on eating behaviour, Robinson, Fleming, and Higgs (2014) compared the effect of a health-based message (which communicated the health benefits of the consumption of fruits and vegetables), a descriptive norm-based message and an injunctive norm-based message on fruit and vegetable, and snack intake. Having been exposed to a descriptive norm, but not to an injunctive norm, increased fruit and vegetable intake and reduced snack intake relative to being exposed to a health message. However, one shortcoming of this study is that it only compared descriptive and injunctive norms to a health-based message and not to a control group which did not receive any message. Therefore, it cannot be concluded from the results that injunctive norms do not exert any effect on eating behaviour.

Mollen, Rimal, and Ruiter (2013) addressed this issue by conducting a field-experiment in which participants were exposed to a healthy descriptive norm, healthy injunctive norm, unhealthy descriptive norm or no norm (no-message control condition). They found that exposure to the healthy descriptive norm resulted in an increase in healthy eating, but that food intake did not differ between participants exposed to the healthy injunctive norm and no norm message. Participants in the healthy injunctive norm condition did consume more healthy food than participants in the unhealthy descriptive norm condition. One of the possible explanations put forward by the authors to explain their finding that the injunctive norm message did not influence eating behaviour is that injunctive messages may need to be coupled with factors that enhance credibility, for example attributing the message to a source close to the target group. In their study, the communicated norm suggested to have a healthy lunch, but it was not revealed who ascribed to this norm. Yun and Silk (2011) examined the association between perceived injunctive norms of a target group and the intention to have a healthy diet. In their study, participants were explicitly asked about the perceived injunctive norms put forward by their peers. And as expected, the results showed that perceived injunctive norms put forward by peers were associated with the intention to have a healthy diet. However, since this study only looked at the association between *perceived* injunctive norms and the intention to have a healthy diet, it remains unclear whether attributing the injunctive norm to a source close to the target group could result in actual behavioural change.

It is therefore not surprising that Verkooijen et al. (2015) stress the importance of future research addressing the effect of injunctive norms on eating behaviour.

One may also wonder whether a combination of both descriptive and injunctive norms could perhaps excel that of using only one type of norm. Research by Cialdini (2003) suggests that there is an added value in using both types of norms relative to using only one. However, Schultz, Nolan, Cialdini, Goldstein, and Griskevicius (2007) did not find a significant added value of the combination of the two types of norms on household energy conservation, although the data did show a pattern in that direction. However, as far as I know, no study has tested the effect of combining both norms on eating behaviour.

The need to belong

It has been suggested that the mixed results obtained by studies that have sought to examine the effect of social norms on eating behaviour may partly be due to the target group under study (Verkooijen et al., 2015). This means that there may be certain participant characteristics that augment or inhibit the extent to which their eating behaviour is affected by social norms. A handful of studies, using the live model design, have sought to identify the moderating effect of such participant characteristics. In these, no moderating effects were found for weight (obese vs. normal weight), diet-behaviour (dieters vs. non-dieters) and extraversion and self-monitoring (Rosenthal & McSweeney, 1979; Rosenthal & Marx, 1979; Herman et al., 2005). However, a higher degree of expressiveness and trait empathy and a lower degree of trait self-esteem resulted in a greater degree of compliance with the descriptive norm (Brunner, 2012; Robinson, Tobias, Shaw, Freeman, & Higgs, 2011).

However, as argued by Robinson, Benwell and Higgs (2013), these findings cannot readily be assumed to apply to remote confederate designs as well. They point out that the underlying mechanisms responsible for participants to match food intake in a live model design are the desire to ingratiate themselves with the model and to make a good impression (self-presentation concerns), and the desire to behave correctly in a specific situation (correctness concerns). Self-presentation concerns can be assumed to be greatly reduced in remote confederate designs as there is no model to impress. And indeed, contrary to what has been found in a live model design, the authors did not find any sign of trait empathy moderating the effect of social norms on eating behaviour in a remote confederate design.

Surprisingly, Higgs (2015) argues that self-presentation concerns do play a role in the explanation of the observed matched food intake in remote confederate designs. She points to the possibility of participants wanting to impress the experimenter, or even making the individual him- or herself feel more socially-responsive and thus more likely to be accepted

by others. She even goes on by proposing a model in which these self-presentation concerns are not independent (but interdependent) from correctness concerns. In this model, following social eating norms is seen as an adaptive behaviour increasing the likelihood of consuming safe foods.

Therefore, it could be expected that individuals with a high need to belong may be more influenced by descriptive norms than individuals with a low need to belong, as these individuals can be expected to have higher self-presentation concerns. However, Robinson, Otten, and Hermans (2016) did not find the need to belong to moderate the effect of perceived descriptive norms on the consumption of sugar-sweetened sodas and sweet pastries. An explanation for this surprising result may be that the study only addressed the effect of *perceived* descriptive norms on eating behaviour. The uncertainty that accompanies the indication of the ruling descriptive norm around may lead individuals with a high need to belong not to value this norm the way they would with an actual descriptive norm.

The authors also argue that self-presentation concerns, and thus the need to belong, may have more impact on the effect of injunctive norms than on the effect of descriptive norms on eating behaviour. Individuals with a high desire to present themselves in the best possible way to belong to others may be more likely to follow the desired behaviour of others instead of the actual behaviour of others. The need to belong could therefore perhaps moderate the effect of injunctive norms on eating behaviour, even though it may not do so on descriptive norms (Robinson et al., 2016).

Impulsivity

As already mentioned, no relation has been found between perceived injunctive norms and intake of fruit and vegetables, sugar-sweetened drinks and unhealthy snacks (Lally et al, 2011). However, the authors argue that the lack of the association between injunctive norms and eating behaviour may have resulted from their all-adolescent study population. They argue that because self-regulatory skills have not been fully developed in adolescents, descriptive norms are probably more important than injunctive norms in this population. Jacobsen, Mortensen, and Cialdini (2011) namely found self-regulatory depletion to be associated with descriptive norms exerting a stronger influence and injunctive norms exerting a weaker influence on eating behaviour. Therefore, one might expect self-regulatory skills to act as moderators on the relation between social norms and eating behaviour.

Robinson et al. (2016) tested this hypothesis for the relation between descriptive norms and eating behaviour. More specifically, they studied the relation between perceived descriptive norms and the consumption of sugar-sweetened soda and sweet pastries and the

moderating effect of self-control (i.e., self-regulation). They found that adolescents with low self-control were more likely to be influenced by perceived descriptive norms than adolescents with high self-control. However, this was only true for the consumption of sweet pastries and not for sugar-sweetened soda, perhaps because individuals with low self-control are more vulnerable to the temptation of high-caloric foods than drinks.

Self-control is practised when choosing a large but delayed reinforcer over a small but immediate reinforcer. Impulsivity, on the other hand, involves choosing the small immediate reinforcer over the larger delayed reinforcer (Vollmer, Borrero, Lalli, & Daniel, 1999). Therefore, impulsivity can also be expected to moderate the effect of descriptive norms on eating behaviour.

A moderating effect of impulsivity may also be expected on the effect of injunctive norms on eating behaviour. However, as already mentioned, Jacobson et al. (2011) found self-regulatory depletion to be associated with injunctive norms exerting a weaker influence on eating behaviour, contrary to what was found with descriptive norms. Therefore, while descriptive norms are expected to exert a greater influence on individuals with a high degree of impulsivity than on individuals with a low degree of impulsivity, injunctive norms can be expected to exert a greater influence on individuals with a low degree of impulsivity than on individuals with a high degree of impulsivity.

Gender

Most of the studies discussed so far have based their results on a sample consisting of largely or solely women, probably because female college students are more easy to recruit. Results of the few studies that address the issue of gender show a trend of males being less able to be influenced by social norms regarding their eating behaviour than females, though the evidence is not unanimous. Salvy, Jarrin, Paluch, Irfan, and Pliner (2007) found that men who were coupled with other men did not match their food intake. However, the amount of food consumed among couples consisting of both a male and a female and of two females did match. Hermans, Herman, Larsen, and Engels (2010) failed to find men adjusting their food intake in the presence of another man, but only when they did not feel hungry (i.e., hungry men did adjust their food intake). De Castro (1994) found women to eat less in the presence of another woman and more in the presence of a man. Men, however, ate the same amount regardless of the gender of their partner. Surprisingly, Castro argues that this was not the result of men being less responsive to social influences, as the higher amount of food that was consumed in the presence of others as compared to when they ate alone was about the same for each gender. Rosenthal and McSweeney (1979) reported that, in their study, men and

women both matched the amount of food consumed with a male eating at a fast rate, but not with a female eating at a fast rate. On the other hand, Croker, Whitaker, Cooke, and Wardle (2009) found that the intention to consume fruit and vegetables, after being exposed to a descriptive social norm message, increased in men, but not in women. The authors suggest that this rather unexpected result may be due to women already having a high intention to consume fruit and vegetables.

Higgs (2015) argues that men's greater drive for distinctiveness and women's greater interest in facilitating positive social bonds may be the underlying reason for the observed trend that the eating behaviour of men is less influenced by social norms. However, she also stresses that further investigation is needed to draw strong conclusions. To my knowledge, no study has ever examined gender as a possible moderator in the effect of social norms on eating behaviour in a remote confederate design.

The present study

The present study aimed to assess the effect of descriptive, injunctive and a combination of both descriptive and injunctive norms on eating behaviour in a remote confederate design. Furthermore, it was assessed whether the need to belong, impulsivity and gender moderated this effect. Therefore, participants were asked to complete an online baseline questionnaire that presented a descriptive, injunctive, both descriptive and injunctive or no (control condition) message about fruit consumption. After that, they were given the choice between fruit or an unhealthy snack as a reward for their participation. The questionnaire also assessed the need to belong, impulsiveness and gender. Furthermore, participants were asked to complete a follow-up online fruit diary for three consecutive days.

It was hypothesized that exposure to a descriptive norm, an injunctive norm and a combination of both norms to eat healthy would result in more fruit consumption than no exposure to a norm. Moreover, exposure to both type of norms was expected to augment the effect of only using one type of norm.

Secondly, it was expected that the need to belong, impulsivity and gender would moderate the effect of social norms on fruit consumption. Females and/or participants with a high need to belong were expected to be influenced more strongly by social norms than males and/or participants with a low need to belong. Individuals with a high degree of impulsivity were expected to be more influenced by descriptive norms than participants with a low degree of impulsivity. In contrast, individuals with a low degree of impulsivity were expected to be more influenced by injunctive norms than individuals with a high degree of impulsivity.

Method

Participants online baseline questionnaire

To assure that the social norm messages were attributed to a source close to the participants, only Dutch-speaking Wageningen University students were desired to participate in this study. Recruitment among Wageningen University students was done using various methods: promotion for participation during small presentations in front of classrooms, Facebook announcements and direct on-campus promotion. Students were told that the aim of the study was to gain insight into the general student life. Participation was on voluntary basis. After completion of the baseline questionnaire, participants were debriefed and rewarded with fruit or an unhealthy snack of their choice. The online baseline questionnaire was filled in by 309 participants. Participants who were not included in the analyses did not complete the baseline questionnaire ($n=42$) or were not students at Wageningen University ($n=2$), leaving 265 participants to be included into the final sample.

The descriptive norm only was shown to 59 participants (75% female, $M_{\text{age}} = 21.12$ years, $SD = 2.68$, age range: 18-31 years). The injunctive norm only was shown to 71 participants (70% female, $M_{\text{age}} = 20.75$ years, $SD = 2.08$, age range: 17-26 years). Sixty-five participants were subjected to both the descriptive and injunctive norm (75% female, $M_{\text{age}} = 20.74$ year, $SD = 2.33$, age range: 17-25 years). The control condition consisted of 70 participants (74% female, $M_{\text{age}} = 20.67$ years, $SD = 2.78$, age range: 18-35 years).

Participants follow-up online fruit diary

At the end of the baseline questionnaire participants were asked to participate in a follow-up of the study that involved the completion of an online diary (measuring their fruit consumption) on three consecutive days. Completing the follow-up online diaries was on voluntary basis and participants were debriefed after completion of the follow-up online diary on day three. Three 15 euro vouchers for a well-known online shop were randomly assigned to participants that completed all three follow-up online diaries. Out of the 265 participants that completed the baseline questionnaire and that were included into the analyses, 91 participants also completed the follow-up online diaries on one or more days. Outliers (>3 SD above the mean of average fruit consumption, $n=3$) were not included in the analyses as these students arguably had not fully understood how to fill in the diaries, leaving 88 participants to be included into the final sample.

From the participants that were shown a descriptive norm in the baseline questionnaire, 24 completed at least one diary (83% female, $M_{\text{age}} = 21.63$ years, $SD = 3.21$, age range: 18-31 years). Of the participants that were shown an injunctive norm in the

baseline questionnaire, 22 completed at least one diary (73% female, $M_{\text{age}} = 20.95$ years, $SD = 2.26$) age range: 18-26 years). Of the participants that were shown both a descriptive and injunctive norm in the online baseline questionnaire, 20 participants completed at least one diary (85% female, $M_{\text{age}} = 20.90$ years, $SD = 2.17$, age range: 17-24 years). Of the participants in the control condition of the online baseline questionnaire, 22 participants completed at least one diary (73% female, $M_{\text{age}} = 20.05$ years, $SD = 2.21$, age range: 18-25 years).

Materials and procedure

After giving their informed consent, participants were randomly assigned to one of four conditions: a descriptive norm only condition, an injunctive norm only condition, both a descriptive and an injunctive norm condition, or a control condition in which they were not subjected to any norm regarding fruit consumption.

The online baseline questionnaire asked participants to fill in some demographics. Then, participants had to indicate whether they agreed or disagreed with certain statements on a 5-point Likert scale. These statements were clustered into three topics: general student life, student eating behaviour and student nightlife. The answers to all these statements were not for analysing purposes, but solely to distract participants from the aim of this study.

After each cluster of questions, a graph was shown to participants, providing them information about the fictitious distribution of answers given by participants of a fictitious pilot study among the same population of Wageningen University students to one statement of each cluster. They were told to watch the graph closely and asked whether they thought it was surprising that more or less than half of the students who had completed the pilot study agreed with the statement.

Participants in the injunctive norm and injunctive norm plus descriptive norm conditions received a fictitious graph following the statements about student eating behaviour that showed the percentage of students that participated in the fictitious pilot study agreed with the statement: "*I think students should eat at least 2 pieces of fruit every day*". The graph showed that of all previous participants 71 percent strongly agreed, 12 percent agreed, 4 percent choose neutral, 10 percent disagreed and 3 percent strongly disagreed with this statement, which indicated that the injunctive norm is to eat at least 2 pieces of fruit every day. A question which inquired if the participant experienced surprise about the percentage that agreed with the statement was included to make sure the provided injunctive norm was processed. Participants could indicate that they felt surprised, that they did not feel surprised, or that they did not have an opinion. As said, participants not subjected to the injunctive norm were also provided with a graph and asked whether the graph surprised them, but the graph

did not concern fruit consumption. Instead, the fictitious graph showed the percentage of students that participated in the fictitious pilot study that agreed with the statement: “*I am eating out more often than I would like to*”. It was, however, necessary to provide each condition with a graph, as otherwise the graph that accompanied the manipulation of the descriptive norm could seem suspicious and also to keep the conditions as equal as possible except for the manipulated norms.

After answers were given to all statements clustered into the three topics, participants were presented with another cluster of statements about certain student behaviours of which participants had to indicate whether the behaviour applied to them, did not apply to them, or whether they did not know whether the behaviour applied to them. All participants then received another fictitious graph about the distribution of answers given to one of these statements by students that were part of the fictitious pilot study.

Participants in the descriptive norm condition and the descriptive plus injunctive norm conditions received a fictitious graph that showed the percentage of answers given by previous participants to the statement: “*On average I eat at least two pieces of fruit per day (which is the daily recommended amount)*”. In the graph they saw that 75% of students who participated in the fictitious pilot study had indicated that the statement applied to them, 22% had indicated that the statement did not apply to them and 3% did not know whether the behaviour applied to them. The descriptive norm propagated by the graph then was to eat at least two pieces of fruit per day. Next, they were asked whether they found the distribution depicted by the graph surprising. Just as the question that inquired about the surprise after the injunctive norm message, participants could indicate that they felt surprised, that they did not feel surprised, or that they did not have an opinion. Participants in the other conditions were also provided with a graph and asked whether the graph surprised them, but this time the graph showed the distribution of answers given by students that participated in the fictitious pilot study to the statement: “*I am a gym member*”.

All participants were then asked which snack they would like to receive after completion of the study. They could choose between an apple, a pear, a chocolate bar or a cookie. Because practical reasons prevented counting the snacks that were actually taken after completion of the study, it was the answer to this question that was taken as the dependent variable.

After this, the Barratt Impulsiveness Scale (BIS-11) was administered, which is a self-report measure of impulsivity (Patton, Stanford, & Barratt, 1995, translated in Dutch by Lijffijt & Barratt, 2005). It consists of 30 items of which respondents need to indicate how

often they themselves engage in particular behaviours (for a review see Stanford, Mathias, Dougherty, Lake, Anderson, & Patton, 2009).

The need to belong was measured with the Need to Belong Scale (NTBS: Schreindorfer & Leary, 1996 in Leary, Kelly, Cottrell, & Schreindorfer, 2013). This self-report measure has shown to be psychometrically sound and constitutes of 10 statements of which respondents need to indicate the degree to which they are true or characteristic of them on a 5-point Likert scale (Leary et al., 2013).

Participants were then given the option to fill in a follow-up online diary for three consecutive days in exchange for the chance of winning a 15 euro voucher for a well-known online shop. The first diary was sent to participants two days after they finished the baseline questionnaire, the second after three days, and the third after four days. In all diaries participants were asked about their behaviour the day before they received the link to the diary. In the diary, participants had to answer multiple filler questions (e.g., “*Did you consume any alcoholic drinks yesterday?*”) as to disguise the goal of the study. The question of importance for this study asked participants whether they had consumed any fruit the day before. Participants were presented with a list of 23 types of fruit of which participants had to indicate which they had consumed along with how many pieces or handful’s. ‘Other’ options were given for types of fruit that were not on the list. Participants could also indicate that did not consume any fruit.

The research protocol was approved by the Social Sciences Ethics Committee of Wageningen University and Research Centre.

Data preparation

To prepare the data for analyses, three items of the NTBS and six items of the BIS-11 were recoded, as these items were negatively keyed. Mean scores for both the NTBS and the BIS-11 were then calculated. The average fruit consumption was calculated by adding up the consumed portions and dividing them by three. Note that some types of fruit constitute more than one portion (e.g. mango), and some types of fruit constitute less than one portion (e.g. kiwi). The consumption of participants who only completed one diary (n=1) or two diaries (n=4) was calculated by dividing their total consumption by one respectively two.

Statistical analyses

Participant characteristics

To test for differences in age between the four conditions in the online baseline questionnaire, an ANOVA was conducted with condition (descriptive/injunctive/descriptive plus injunctive/control) as between-subject factor and age as dependent variable. To test for

differences in gender, a Chi-square test for independence was conducted with condition (descriptive/injunctive/descriptive plus injunctive/control) as between-subject factor and gender (male/female) as dependent variable.

A Chi-square test for independence was conducted with condition (descriptive/descriptive plus injunctive) as between-subject factor and felt surprise about the descriptive norm message (yes/no/no opinion) as dependent variable to test whether the surprised felt about the descriptive norm message by participants subjected to only the descriptive norm differed from that of participants subjected to both the descriptive and injunctive norms. A Chi-square test for independence was also conducted with condition (injunctive/descriptive plus injunctive) as between-subject factor and the felt surprise about the injunctive norm message (yes/no/no opinion) as dependent variable to test whether the surprise felt about the injunctive norm message by participants subjected to only the injunctive norm differed from that of participants subjected to both the descriptive and injunctive norms.

Another Chi-square test for independence with felt surprise about the descriptive norm message (yes/no/no opinion) and felt surprise about the injunctive norm message (yes/no/no opinion) as variables was used to test whether the surprise felt about the descriptive norm message differed from the surprise felt about the injunctive message of participants that were subjected to both norms.

To test whether the surprise felt about the descriptive norm message of participants subjected to only the descriptive norm differed from the surprise felt about the injunctive norm message of participants subjected to only the injunctive norm, a Chi-square test for independence was conducted with condition (descriptive/injunctive) as between-subject factor and felt surprise about the injunctive norm message (yes/no/no opinion) as dependent variable.

The same analyses were used to test for any differences in age, gender and felt surprise about the descriptive and injunctive norm messages between conditions in the subgroup that completed the follow-up online diaries.

Social norms and fruit consumption

To answer the research question, a binary logistic regression analysis was conducted with norm condition (descriptive/injunctive/descriptive plus injunctive/control), the need to belong, impulsivity and gender (male/female) as independent variables and choice of snack (healthy/unhealthy) as dependent variable. Of interest to this research were the main effect of norm condition and its interaction with need to belong, impulsivity and gender. It was

expected that participants subjected to the descriptive, injunctive and descriptive plus injunctive norm messages would choose a healthy snack as reward for their participation more often than participants in the control condition. Females, and participants scoring high on measures of need to belong were expected to be more susceptible to the effect of the social norm messages on choice of snack. Greater susceptibility to the effect of the descriptive norm message on choice of snack was expected with participants scoring high on the measure of impulsivity. On the other hand, greater susceptibility to the effect of the injunctive norm message on choice of snack was expected with participants scoring low on the measure of impulsivity.

An ANCOVA was conducted with norm condition (descriptive/injunctive/descriptive plus injunctive/control), the need to belong, impulsivity and gender (male/female) as independent variables and reported fruit consumed in three days after exposure to the norm as dependent variable. Of interest to this research were the main effect of norm condition and its interaction with need to belong, impulsivity and gender. It was expected that the descriptive, injunctive and descriptive plus injunctive conditions would result in more fruit intake than the control condition. Females, and participants scoring high on measures of need to belong were expected to be more susceptible to the effect of the social norm messages on fruit intake. Greater susceptibility to the effect of the descriptive norm message on fruit intake was expected with participants scoring high on the measure of impulsivity. On the other hand, greater susceptibility to the effect of the injunctive norm message on fruit intake was expected with participants scoring low on the measure of impulsivity.

Results

Participant characteristics online baseline questionnaire

Of the participants who completed the online baseline questionnaire, the subgroups that were subjected to only the descriptive norm, only the injunctive norm, both the descriptive and injunctive norm, and the control subgroup were found not to differ in age ($F(3,261) = 0.41, p = .744$) and gender ($\chi^2(3) = 0.52, p = .914$).

The surprise felt about the descriptive norm message by both subgroups that were subjected to the descriptive norm did not differ ($\chi^2(2) = 2.25, p = .325$). The surprise felt about the injunctive norm message by both subgroups that were subjected to the injunctive norm did also not differ ($\chi^2(2) = 0.92, p = .632$).

Of the subgroup that was subjected to both the descriptive and injunctive norm, no difference was found between the surprise felt about the descriptive norm message and the surprise felt about the injunctive norm message ($\chi^2(4) = 0.12, p = .942$).

The surprise felt about the descriptive norm message by the subgroup that was only subjected to the descriptive norm did however differ from the surprise felt about the injunctive norm message by the subgroup that was only subjected to the injunctive norm ($\chi^2(2) = 14.16, p = .001$). This effect was of medium strength ($\Phi = .33$). Participants who only received the injunctive norm were less likely to be surprised by its message (33.8%) than participants who only received the descriptive norm (61.1%).

Table 1 shows the number and percentages of participants that felt (un)surprised about the descriptive and injunctive norm messages per condition that completed the online baseline questionnaire.

Table 1

Number of Participants and Percentage That Felt Surprise About Norm Messages per Social Norm Condition in Baseline Online Questionnaire

Condition	<i>n</i>	%	%	%	%
		Surprised Descriptive Norm	Unsurprised Descriptive Norm	Surprised Injunctive Norm	Unsurprised Injunctive Norm
Descriptive	59	66.1	30.5		
Injunctive	71			33.8	63.4
Descriptive+Injunctive	65	67.7	32.3	33.8	60.0

Participant characteristics follow-up online diaries

Of the participants who completed the follow-up online diaries, the subgroups that were subjected to only the descriptive norm, only the injunctive norm, both the descriptive and injunctive norm, and the control subgroup were also found not to differ in age ($F(3,84) = 1.50, p = .221$) and gender ($\chi^2(3) = 1.70, p = .638$).

The surprise felt about the descriptive norm message by both subgroups that were subjected to the descriptive norm did not differ ($\chi^2(2) = 0.93, p = .628$). The surprise felt about the injunctive norm message by both subgroups that were subjected to the injunctive norm did also not differ ($\chi^2(2) = 0.40, p = .524$).

Of the subgroup that was subjected to both the descriptive and injunctive norm, no difference was found between the surprise felt about the descriptive norm message and the surprise felt about the injunctive norm message ($\chi^2(4) = 1.90, p = .168$).

The surprise felt about the descriptive norm message by the subgroup that was only subjected to the descriptive norm did however differ from the surprise felt about the injunctive norm message by the subgroup that was only subjected to the injunctive norm ($\chi^2(2) = 7.65, p = .022$). This effect was of medium strength ($\Phi = .41$). Participants who only received the injunctive norm were less likely to be surprised by its message (22.7%) than participants who received only the descriptive norm (58.3%).

Table 2 shows the number and the percentages of participants that felt (un)surprised about the descriptive and injunctive norm messages per condition that completed both the online baseline questionnaire and the follow-up online diaries.

Table 2

Number of Participants and Percentage That Felt Surprise About Norm Messages per Social Norm Condition of Follow-up Online Diaries Subgroup

Condition	n	%	%	%	%
		Surprised Descriptive Norm	Unsurprised Descriptive Norm	Surprised Injunctive Norm	Unsurprised Injunctive Norm
Descriptive	24	58.3	37.5		
Injunctive	22			22.7	77.3
Descriptive+Injunctive	20	65.0	35.0	15.0	85.0

Social norms and fruit consumption

The logistic regression model, ascertaining the effects of condition, gender, impulsivity and the need to belong on the likelihood of either choosing a healthy or unhealthy snack turned out not to be significant ($\chi^2(6) = 5.07, p = .534$). This means that participants' choice for a healthy or unhealthy snack as a reward for participating in the study was no different, whether they were subjected to only the descriptive norm, only the injunctive norm, both the descriptive and injunctive norm, or to no norm at all. This also means that the choice was found not to differ between men and women and was not related to measures of the need to belong or impulsivity. Over all conditions, 40.8% of the participants chose a healthy snack and 59.2% chose an unhealthy snack. The number and the percentage of participants choosing a healthy snack as reward for participation per condition is depicted in Table 3.

Table 3

Number and Percentage of Participants That Chose a Healthy Snack per Social Norm Condition

Condition	<i>n</i>	%
Descriptive	59	42.4
Injunctive	71	33.8
Descriptive+Injunctive	65	41.5
Control	70	45.7

The ANCOVA revealed that the combination of condition, gender, impulsivity and the need to belong also did not significantly affect the reported amount of fruit eaten in the three days subsequent receiving either a social norm or no social norm ($F(9,78) = 1.22, p = .297$).¹ This means that the reported amount of fruit consumed by participants during the three days was no different from whether they were subjected to only the descriptive norm, only the injunctive norm, both the descriptive and injunctive norm, or no norm. The amount of reported fruit consumed did also not differ between men and women and was not related to measures of the need to belong and impulsivity. Over all conditions, the mean amount of fruit eaten was 2.12 ($SD = 1.36$) The number of participants, means, standard deviations and 95% confidence intervals for daily fruit consumption per social norm condition is depicted in Table 4.

Table 4

Number of Participants, Means, Standard Deviations and 95% Confidence Intervals for Daily Fruit Consumption per Social Norm Condition

Condition	<i>n</i>	<i>M</i>	<i>SD</i>	95% CI	
				<i>LL</i>	<i>UL</i>
Descriptive	24	2.35	1.37	1.81	2.90
Injunctive	22	2.03	1.56	1.46	2.60
Descriptive+Injunctive	20	1.56	0.97	0.96	2.15
Control	22	2.46	1.36	1.89	3.02

Note. *CL* = confidence interval; *LL* = lower limit; *UL* = upper limit.

¹ Significance was also not reached when excluding those participants who only completed the diaries on one or two days instead of three days ($F(9,73) = 1.08, p = .387$), or when outliers were included in the analysis ($F(9,81) = 0.65, p = .751$).

Discussion

This study examined the effect of descriptive and injunctive norms on eating behaviour in a remote confederate design and also sought to examine whether this effect is moderated by the need to belong, impulsivity and gender. Unexpectedly, fruit consumption was not found to change in response to descriptive and/or injunctive norms. This held true independently of the strength of participants' need to belong, impulsivity and their gender. Therefore, brief interventions aimed at increasing healthy eating, and specifically at increasing fruit intake, are probably not effective enough by simply communicating messages containing information about how much fruit others eat and/or how much fruit others think one should eat.

These results contradict many other studies that did (partly) find descriptive norms affecting eating behaviour (Feeney et al., 2011; Robinson, Benwell, & Higgs, 2013; Prinsen et al., 2013; Pliner & Mann, 2004; Roth et al., 2001; Burger et al, 2010; Robinson, Fleming, & Higgs, 2014). One reason for this discrepancy may be the reduced role of the experimenter in the current study, as this study allowed participants to choose the snack they wanted as a reward for participating in the online baseline questionnaire and to fill in the follow-up online diaries at their leisure, without ever coming across the experimenter. This highlights the role that self-presentation concerns may play in explaining the underlying mechanism of the effect of descriptive norms on eating behaviour in remote confederate designs, as these were heavily reduced in the current study. Higgs (2015) hypothesized that self-presentation concerns and correctness concerns are mechanisms behind the power of both live and remote confederate designs. Given the lack of effects in the current study, self-presentation concerns may even be the sole driving factor for individuals to adhere to descriptive norms. Correctness concerns are namely still thought to have been present in the current study. The usefulness of promoting healthy eating behaviour through interventions that communicate what others do or think should be done therefore becomes questionable, as observing the presence of someone else seems to be a prerequisite for social norms to exert their influence. This is supported by the one study that also did not find descriptive social norms to influence eating behaviour. This study namely also minimized participant-experimenter contact by having participants fill in online diaries (Verkooijen et al., 2015).

The finding that injunctive norms were also not found to influence fruit intake replicates the results of the study by Mollen et al. (2013), who found that healthy descriptive norms, but not unhealthy descriptive norms nor injunctive norms, exert influence on eating behaviour. However, the present study explicitly attributed the injunctive message to a source

close to the target group (viz., other students of Wageningen University), overcoming a limitation attributed to the negative results obtained by the study of Mollen et al. (2013). Attributing the injunctive norm message to a source close to the target group would supposedly enhance its credibility, making it more likely to follow (Louis, Davies, Smith, & Terry, 2007). However, the results of the present study seem to show that attributing the injunctive norm to a close source is not sufficient for it to exert any influence on eating behaviour. Since injunctive norms undeniably do have the power to influence behaviour, it is therefore important to look for prerequisites that further enhance the norms' credibility or increase people's feeling of involvedness or need to comply with the norm.

The results also show that descriptive and injunctive norms do not affect fruit intake in a remote confederate design regardless someone's need to belong, impulsiveness or gender. Considering the points above does not eliminate the possibility that these characteristics do moderate the effect of social norms on eating behaviour. With strong theoretical underpinnings, future research should not ignore these possible moderators, as knowledge about who is more and who is less susceptible to forms of social norms could help in personalising messages and in maximizing the effectiveness interventions.

Limitations

The descriptive norm in this study communicated the percentage of students who on average eat at least two pieces of fruit per day. The injunctive norm communicated the percentage of students who think other students should eat at least two pieces of fruit per day. With a national average fruit consumption in the Netherlands of 1,24 piece per day for females and 1,10 piece per day for males (Volksgezondheidszorg.info, 2016), it was thought that the fruit consumption communicated by the social norms and the pre-experimental fruit consumption would differ to such a degree that following the norms put forward could actually change behaviour. However, the national average fruit consumption is considerably lower than the average fruit consumption of participants of this study who completed the follow-up online fruit diaries. This holds true for all four conditions with a mean of 2,12 pieces per day (see Table 4). Participants therefore may not have felt socially compelled to change their behaviour, as this may already have been in line with the communicated norms. Unfortunately, performing a pre-test was not within the realm of this research, so it cannot be determined whether the norms elicited any effect for those students who did not already consume an average of two or more pieces per day.

Another possible reason that may account for the fact that social norms were not found to influence eating behaviour is that the messages communicated by the social norms were

already perceived to be the existing norms by most students. Even though the content of the norms put forward in this study was fabricated, and therefore not known to hold any truth-value, it may be the case that the perceived norms of students matched that of the communicated norms and hence already exerted their influence on the eating behaviour of students. Being convinced that other students eat lots of fruit (descriptive norm) and also believe other students should eat the nationally recommended two daily pieces of fruit (injunctive norm) (Gezondheidsraad, 2015) may have already influenced the fruit intake of participants. In line with this thinking is the finding that more than 61% of the participants subjected to the injunctive norm was not surprised to hear that most of the students believe that others should at least eat two pieces of fruit per day. This means that the communicated injunctive norm matched the perceived injunctive norm of most participants. Pre-existing perceptions of the ruling norm would then undermine its potential to promote fruit intake. However, pre-existing perceptions of the descriptive norm did not match with the communicated descriptive norm. Only 31% of the participants indicated that they were not surprised about the fact that the majority of students eat at least two pieces of fruit per day. This means that student's pre-existing perceptions about the ruling descriptive norm cannot be held responsible for not finding an effect of the descriptive norm on eating behaviour.

In the online baseline questionnaire, the effect of the social norms on fruit consumption was measured simply by counting the number of participants that preferred fruit or unhealthy snack as reward for participating in the study. However, one may wonder about the adequateness of this operationalisation of fruit intake and whether the result that both types of social norms did not exert any influence on this measure really means that the social norms did not influence fruit intake. It may solely tell us something about their preference of a healthy snack over a unhealthy snack or vice versa. Choosing an unhealthy snack over a healthy snack as reward does not mean that participants did not increase their fruit intake later that they, which would mean that the communicated social norms did influence participants' fruit consumption. This limitation was addressed by also asking participants to complete the follow-up online diaries. These fruit diaries were arguably a better operationalisation of fruit intake. Unfortunately, these follow-up online diaries were completed by less than a third of the participants that completed the baseline online questionnaire, which means that the statistical power necessary to detect differences in fruit intake of the four conditions was also greatly reduced.

As all participants in this study were all Wageningen University students, only a highly educated sample was studied. Perhaps, highly educated individuals are less susceptible

to social norms than lower educated individuals. This may also be part of the reason why social norms were not found to exert any influence on eating behaviour. Future studies are needed to assess the possible moderating effect of level of education on the effect of social norms on eating behaviour.

Another limiting factor in this study is the extent to which the social norms were manipulated. Both descriptive and injunctive norms were communicated through one sentence and one graph imbedded in a much larger questionnaire covering various topics. One may wonder about the impact of such a small manipulation. However, many of the discussed studies, which did find social norms influencing eating behaviour, have also used manipulations of rather small magnitude (e.g. Feeney et al., 2011). It can therefore be concluded that this study did, in fact, had the potential to influence students' fruit consumption. However, publication bias in favour of those studies that did find social norms to influence eating behaviour may have caused too high expectations towards the possibilities of small social norm interventions to change peoples' eating behaviour. Nonetheless, healthy eating could perhaps be promoted with more clearly and explicitly communicated norms.

Conclusion

The impact of social norms in daily life is unmistakable. Especially today, with rising health problems due to counterproductive eating practices, using social norms in the creation of interventions tackling these health problems would seem to be a most promising endeavour. Until now, research on the effect of social norms on eating behaviour has supported this premise with the finding that eating behaviour can be affected by even the littlest bit of information on the (sometimes fabricated) ruling social norms. However, the current study has shown that the presence of the experimenter may have an important share in explaining the promising results of these previous studies. Therefore, more research is needed to discover the prerequisites under which interventions using social norms could best alter counterproductive eating behaviour in a world that is (perhaps unfortunately) not under the supervision of an experimenter.

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