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# Reducing fat intake using implementation intentions: A meta-analytic review

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**Purpose.** To study the efficacy of forming implementation intentions for fat intake reduction as well as possible moderating variables.

**Methods.** Systematic review and meta-analysis of 12 empirical studies ($N$ = 3,323) published in English and Spanish in the Web of Science (Core Collection) and MEDLINE (1990–January 2016) databases.

**Results.** This study found that the efficacy of planning interventions on fat consumption reduction was higher than expected, as a moderate overall effect of implementation intentions was observed ($d$ = 0.488). Moreover, planning for a fat intake reduction seems to be more powerful for men than for women ($\beta = -.623$; $p$ = .025) and in cases where there is no monitoring during the intervention ($d$ = 0.671 vs. $d$ = 0.231).

**Conclusions.** Previous research was sceptical of the efficacy of planning in the case of avoiding goals in healthy eating. However, our results show that planning is an efficient intervention that can be used by health education programmes to reduce fat intake and, therefore, increase citizen well-being. These results also support the existence of a key variable in the implementation intentions process, that is, goal complexity, and the presence of two moderating variables, that is, gender and monitoring.

## Statement of contribution

***What is already known on this subject?***

- Implementation intentions are action plans subordinate to goal intentions that specify the 'when, where, and how' of responses leading to goal attainment.
- In healthy eating, the average effect of forming implementation intentions is small to medium, but this efficacy changes depending on the type of intended behaviour. Past evidence shows that the effect size seems to be lower when the intervention aims at reducing unhealthy behaviours versus promoting healthy behaviours.

***What does this study add?***

- Forming implementation intentions is an efficient intervention to reduce fat intake with a medium overall effect.
- The efficacy of this intervention is increased when men are targeted and when there is no monitoring during the process.
- This study introduces a new line of research focused on the study of the effect of planning on complex goals.

Healthy eating is becoming an increasingly important behaviour due to problems resulting from poor dietary habits. Prior to 1980, obesity rates were well below 10%

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in the Organization for Economic Co-operation and Development (hereafter OECD) countries, while presently, in almost half of the OECD countries, 50% or more of the populations are overweight. Obesity, which is a key risk factor for numerous chronic diseases, is a major public health concern and has become increasingly widespread in the past 5 years (OECD, 2014). Across the OECD, 18% of the adult population is obese, and one in five children is overweight. Being overweight or obese has a negative effect on quality of life and has significant psychological, sociological, and economic costs (Bublitz, Peracchio, & Block, 2010). From the Transformative Consumer Research perspective, conducting practical research that can be used by consumers, activists, policymakers, and industries to increase the wellbeing of consumer citizens is important (Mick, 2006; Ozanne *et al.*, 2011). In this particular case, our role as consumer researchers is to develop, test, and perfect the instruments that are used to design social policies aimed at promoting healthy eating. The current study sought to evaluate the efficacy of implementation intentions, the psychological interventions intended to help people achieve their goals of healthy eating.

There are several theories that use *intention* to act as the most important predictor of subsequent action (e.g., theory of planned behaviour, Ajzen, 1991). These models are concerned with people's motivation to perform a health behaviour, which can be considered to provide strong predictions of behavioural intentions. However, strong intentions do not always lead to corresponding actions (Rhodes & De Bruijn, 2013; Sheeran, 2002). It is for this reason that Gollwitzer (1993) distinguishes between two phases of goal-directed activities: motivational and volitional. The first phase, the motivational phase, is focused on choosing between goals and implied actions in order to make a decision regarding the goal to be pursued. This phase involves the deliberation of expectations and incentives. The volitional phase is focused on planning the action to achieve the goal selected. A construct that appears important in the volitional phase, in order to translate intentions into actions, is implementation intentions (Gollwitzer, 1990). Implementation intentions try to fill the gap between intention and behaviour and serve as the main theoretical framework for the present research.

Implementation intentions are action plans subordinate to goal intentions that specify the 'when, where, and how' of responses leading to goal attainment. These intentions have the structure of 'When situation x arises, I will perform response y!' and thus link anticipated scenarios with goal-directed responses. Implementation intentions delegate the control of goal-directed responses to anticipated situational cues that (when actually encountered) elicit these responses automatically. For example, 'When I go to a restaurant, I will order a salad as a side dish instead of chips'. Because implementation intentions imply the selection of a suitable response applicable to a future situation (i.e., a good opportunity), it is assumed that the mental representation of this situation becomes highly activated and thus more easily accessible (Gollwitzer, 1990).

Implementation intentions are powerful strategies used to promote health-related behaviours, as shown in previous meta-analyses (Adriaanse, van Oosten, de Ridder, de Wit, & Evers, 2011; Bélanger-Gravel, Godin, & Amireault, 2013; Gollwitzer & Sheeran, 2006). In particular, in healthy eating, the average effect of forming implementation intentions is small to medium (Adriaanse *et al.*, 2011). However, when studies have focused on specific healthy eating behaviours, researchers have obtained mixed results. For certain actions, such as fruit or vegetable intake, the positive effect of implementation intentions seems to be large (Gratton, Povey, & Clark-Carter, 2007; Hankonen, Absetz, Kinnunen, Haukkala, & Jallinoja, 2013; Kellar & Abraham, 2005; Kreausukon, Gellert,

Lippke, & Schwarzer, 2012; Luszczynska & Cieslak, 2009; Reuter, Ziegelmann, Wiedemann, & Lippke, 2008). However, past evidence shows that the effect size is lower when the intervention aims at reducing unhealthy behaviours, such as non-healthy snacking or fat consumption (Adriaanse, de Ridder, & de Wit, 2009; Verhoeven, Adriaanse, De Ridder, De Vet, & Fennis, 2013), although the results are still inconclusive due to the limited sample sizes of previous meta-analyses (Adriaanse *et al.*, 2011) and mixed evidence found in this area (Sullivan & Rothman, 2008). Consequently, there is a need to shed light on the effect of planning interventions in these types of behaviours. As a result, the main goal of this research was to clarify the effectiveness of implementation intentions on reducing fat intake. Moreover, fat intake reduction is a complex goal, and the individual requires some degree of knowledge on the subject, especially because the course of action to achieve the goal is unclear due to the existence of more than one alternative, and each course of action has a different degree of effectiveness (De Vet, 2007). Goal complexity has been unused in previous meta-analyses, although some authors have noted its possible influence on the intervention (Luszczynska, Scholz, & Sutton, 2007; Verplanken & Faes, 1999).

We conducted a quantitative meta-analysis of all published studies regarding implementation intentions and fat intake. This approach integrated the results from a large collection of statistical analyses from individual studies (Glass, 1976). As the method used was a meta-analysis of reported findings, the authors sought to identify possible moderator variables that may influence the psychological intervention. As a result of our conclusions, we propose a research agenda for future studies in implementation intentions aimed at increasing their efficacy.

This research also contributes to the goals of policymakers. The World Health Organization suggests that among other recommendations, people should limit total overall fat as a source of energy intake and shift the fat that is consumed from saturated fats to unsaturated fats. As the goal of our research was to verify the efficacy of the use of implementation intentions and in which conditions they work best, our results will be useful for designing efficient health promotion interventions and communication messages to help citizens reduce their fat intake.

## Methods

### *Search and selection of studies*

The literature search and data extraction were performed in July 2014. We searched for studies published in English and Spanish in the Web of Science (Core Collection) and MEDLINE (1990–January 2016) databases. The search was conducted using the following keyword search terms: implementation intention, if-then, and action plan*, in all combinations with the following: eat*, diet, nutrition, excluding combinations with the word plant*. To increase the scope of our search, cross-citations from previous narrative reviews were explored as well (i.e., the review conducted by Adriaanse, Vinkers, De Ridder, Hox, & De Wit, 2010). The search results produced 81 articles. From these articles, which included different types of healthy eating consumer behaviour, we found 17 articles that studied fat consumption. The studies that were deemed relevant for the meta-analysis had the following characteristics: (1) experiments promoting a healthy diet, specifically regarding fat intake; (2) studies assessing implementation intentions or action planning; (3) papers published in peer-reviewed journals; (4) the use of planning was either measured or manipulated, and a variety of reliable (food diaries), or less reliable

(single item assessments of food intake), outcome measures were employed, allowing for the unique effect of planning on eating behaviour; and (5) the studies were quantitative. Application of these inclusion criteria resulted in the identification of 12 empirical studies, which are shown in Table 1.

### *Data collection*

This meta-analysis uses the standardized mean difference (SMD) *d* to measure the effect size, which is the difference between the means for two groups divided by a pooled standard deviation. According to Cohen's (1992) power primer, $d = 0.20$ represents a 'small' effect, $d = 0.50$ represents a 'medium'-sized effect, and $d = 0.80$ represents a 'large' effect. In articles that did not report the effect size, it was calculated.

Data were extracted independently by two reviewers (IC and IV), and disagreements were resolved by consensus with a third reviewer (RR). Before analysing the data set, some decisions were made. First, in some studies, the delivery of the implementation intentions varied across experimental groups (e.g., including coping plans or barrier identification). Only groups with equivalent interventions were included to favour homogeneity and to isolate the effect of implementation intentions. That is, when the study included several groups of implementation intentions, and some groups had in conjunction another psychological intervention (e.g., coping plans), the group with implementation intentions alone was selected for the meta-analysis, for comparisons with the intervention groups in other studies that used implementation intentions alone. We did the same with the control condition, including active control conditions without other psychological interventions when possible. Second, when multiple follow-ups were conducted during the experiment (e.g., 1 week, 4 weeks, and 6 months after the study started), we analysed the follow-up measure that was more similar to follow-ups of the other studies included in the meta-analysis in order to facilitate comparability (e.g., Luszczynska, Sobczyk, & Abraham, 2007; Schroder, 2010). Finally, when multiple measures of the dependent variable were reported, we took fat consumption as the first outcome. The other variables are reported in Table 1.

### *Meta-analysis procedure*

We determined the effect size for all the studies selected according to the mentioned criteria using the SMD, linear correlation coefficient, or standardized regression coefficient depending on the data. All of these measures were transformed into *d*, as described by Borenstein, Hedges, Higgins, and Rothstein (2009), and conversion formulae (Laroche & Soulez, 2012). The initial meta-analysis was performed with pooled effect sizes using the inverse variance statistical method with random effects models (REMs). The election of REMs was based on two main criteria: (1) Data were gathered from a series of studies performed by researchers operating independently and therefore unlikely to be functionally equivalent and (2) the results of our analysis will be easy to generalize or use in different scenarios. The pooled effect sizes were reported as the SMD with a 95% CI, and homogeneity is reported with the $I^2$ and *p*-values. To explain heterogeneity, a second set of analyses was performed to test the possible presence of moderator variables. When the possible moderator was dichotomous, we explored the data through analyses of the means of subgroups; when it was continuous, we used meta-regression.

**Table 1.** Description of studies

| 1st author | Year | *N* | % Women | Age (mean) | Type of sample | Measured behaviour | Duration (weeks) | Initial training | Monitoring | II format | Dependent variable | *d* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Armitage | 2004 | 127 | 60 | 33.32 | Random | Fat intake + other/s | 4 | No | No | If-Then | Fat (g per day) | 0.34 |
| De Vries | 2008 | 2,827 | 55 | 49 | Random | Fat intake + other/s | 36 | No | Yes | When, where, how | Fat (g per day) | 0.05 |
| Luszczynska | 2007 | 199 | 36 | 54.25 | Obese/health problems | Fat intake + other/s | 24 | Yes | No | When, where, how | Fat (g per day) | 0.43 |
| Prestwich | 2008 | 57 | 76 | 22.2 | Random | Fat intake | 4 | Yes | Yes | If-Then | % calories from fat | 0.54 |
| Renner | 2008 | 662 | 56 | 32 | Random | Fat intake | 24 | Yes | No | If-Then | Cholesterol | 0.24 |
| Scholz | 2009 | 316 | 82 | 44.25 | Obese/health problems | Fat intake | 12 | No | Yes | When, where, how | Low fat prod. intake | 0.45 |
| Scholz | 2013 | 373 | 72 | 52.42 | Obese/health problems | Fat intake | 54 | Yes | Yes | When, where, how | Fat (g per day) | 0.18 |
| Schroder | 2010 | 91 | 85 | 42.6 | Obese/health problems | Fat intake | 24 | Yes | Yes | When, where, how | Cholesterol | 0.23 |
| Schwarzer | 2008 | 116 | 40 | 54.57 | Obese/health problems | Fat intake | 8 | No | No | When, where, how | Fat prod. intake | 0.41 |
| Soureti | 2012 | 571 | – | 46.89 | Obese/health problems | Fat intake | 5 | Yes | No | When, where, how | Low fat prod. intake | 0.24 |
| Zhang | 2012 | 43 | 49 | 20.56 | Random | Fat intake + other/s | 4 | No | No | When, where, how | % fat intake | 0.81 |
| Zhou | 2013 | 240 | 44 | 19.6 | Random | Fat intake + other/s | 12 | No | No | When, where, how | Fat (g per day) | 1.12 |

## Results[1]

### *Description of studies*

The 12 studies eligible for inclusion in this meta-analysis were performed between 2004 and 2013, although the vast majority ($k$ = 10) were from 2008 or later. The duration of the interventions ranged from 2 weeks to 12 months, with an average of 13.92 weeks. Most studies were performed in European countries ($k$ = 9), while three were performed in non-European countries, including South Korea (Renner *et al.*, 2008), the United States (Schroder, 2010), and China (Zhou, Gan, Knoll, & Schwarzer, 2013). Among the studies finally included in the meta-analysis, $k$ = 7 were experimental, while $k$ = 5 were correlational.

#### *Characteristics of the participants*

The total sample included 3,323 participants. The average percentage of participants who dropped out was 36.38%. The average age of the participants was 41.83 years. There were nearly the same proportions of women (49.5%) and men. All study participants were adults. Half of the studies ($k$ = 6) were performed by people chosen randomly regarding their health status (the general public and students), who may or may not have had any special dietary restrictions. The rest of the studies ($k$ = 6) were performed among participants who had a special interest in maintaining a healthy diet, including individuals who were obese, overweight, and/or with health problems (Scholz, Ochsner, & Luszczynska, 2013; Schroder, 2010; Schwarzer & Luszczynska, 2008; Soureti, Hurling, van Mechelen, Cobain, & ChinAPaw, 2012) and adults who participated in an online nutrition programme (Scholz, Nagy, Göhner, Luszczynska, & Kliegel, 2009).

#### *Behavioural characteristics*

The health-related behaviour analysed was the reduction in fat intake. Just over half of the studies ($k$ = 7) were only intended to lower the fat intake of participants. The other studies ($k$ = 5) had additional objectives, which were all aimed at a healthier lifestyle. The additional objectives included exercise (Luszczynska, Scholz, *et al.*, 2007; Luszczynska, Sobczyk, *et al.*, 2007), increasing the consumption of fruits and vegetables and exercise (Zhang & Cooke, 2012), all the above plus quitting smoking (De Vries, Kremers, Smeets, Brug, & Eijmael, 2008), and taking vitamins (Renner *et al.*, 2008; Zhou *et al.*, 2013). The dependent variable (reduced fat intake) was measured with a single variable in most studies ($k$ = 9).

#### *Characteristics of the implementation intention interventions*

A planning intervention was performed alone in some cases ($k$ = 6), while in other studies ($k$ = 6), it was accompanied by other interventions. Regarding the format of the implementation intention formulation, based on the instructions received by participants, some studies used the 'if-then' format ($k$ = 3), what is demonstrated to be key in generating the strong cue–response link, while others specified 'when, where, and how' to act ($k$ = 9) and what takes a more 'global' approach. According to Chapman, Armitage, and Norman (2009), the first format obtains better results in promoting behaviour change.

[1] *To better visualize the results, PRISMA check list is included at the end of the paper.*

In other cases, the participants were followed up during the intervention (De Vries *et al.*, 2008; Prestwich, Ayres, & Lawton, 2008; Scholz *et al.*, 2009, 2013; Schroder, 2010). Additionally, the participants in some studies received initial training ($k$ = 6) to deliver knowledge about the type of food to be eaten to achieve the diet goal (Luszczynska, Scholz, *et al.*, 2007; Luszczynska, Sobczyk, *et al.*, 2007; Prestwich *et al.*, 2008; Renner *et al.*, 2008; Scholz *et al.*, 2013; Schroder, 2010). Finally, in some cases ($k$ = 5), during the intervention, the individual was monitored by health professionals to verify that there were no problems in following the study requirements.

### *Meta-analysis*

Overall, implementation intentions yielded a medium significant, pooled effect size for fat intake ($k$ = 12; SMD = 0.488; 95% CI = 0.239; 0.736), as shown in Figure 1, although homogeneity was not found ($I^2$ = 88.8%, $p$ = .000).

As none of the studies included in the meta-analysis was from the grey literature, the documents were not controlled by commercial publishers (Schöpfel & Farace, 2010), and the possible existence of publication bias was examined using a funnel plot (Bélanger-Gravel *et al.*, 2013), as shown in Figure 2. Although this plot is not symmetrical, no gap is visible near the bottom on the left. Therefore, it seems that no small or non-significant studies were missing in the sample, indicating no evidence of publication bias (Borenstein *et al.*, 2009).

The existence of heterogeneity led us to look for possible moderator variables of the studied process. The following dichotomous variables were investigated in a subgroup analysis (Table 2):

1. *Type of sample* (regarding health): This factor included two groups. The first was formed by people chosen randomly regarding their health (general public and students), and this group had an effect size of $d$ = 0.444 and significant heterogeneity ($Q$ = 43.639***). Meanwhile, the second group was composed of overweight people or those with health concerns. The effect size here was $d$ = 0.698, and again, significant heterogeneity was found among the studies included in this group

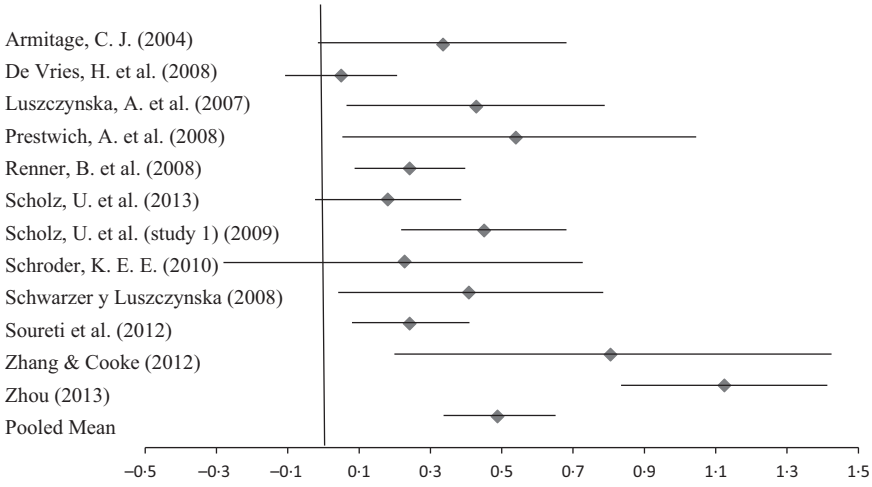


**Figure 1.** Forest plot.

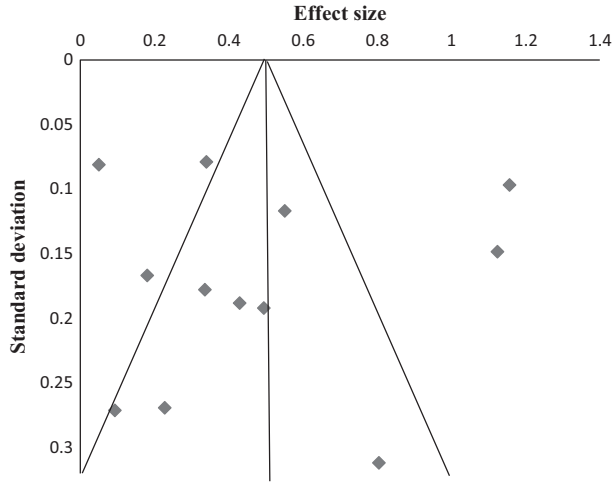


**Figure 2.** Funnel plot.

**Table 2.** Moderator effects. Subgroup analysis

| | | | | | | Differences across groups | |
|---|---|---|---|---|---|---|---|
| Factor | *N* | *k* | *d* | 95% CI | *Q* | *z* | *p* |
| Type of sample | | | | | | | |
| Random | 1737 | 6 | 0.444 | 0.115; 0.772 | 43.639*** | 1.427 | .153 |
| Health problems | 1586 | 6 | 0.698 | 0.597; 0.798 | 39.930*** | | |
| Health objectives | | | | | | | |
| More than 1 | 1672 | 5 | 0.420 | 0.051; 0.788 | 43.154*** | 0.702 | .482 |
| Just 1 | 1651 | 7 | 0.658 | 0.559; 0.756 | 46.549*** | | |
| Number of interventions | | | | | | | |
| More than 1 | 1078 | 3 | 0.345 | 0.155; 0.544 | 3.135 | 0.816 | .414 |
| Just 1 | 2245 | 9 | 0.511 | 0.292; 0.729 | 43.938*** | | |
| Initial training | | | | | | | |
| No | 1450 | 6 | 0.442 | 0.094; 0.789 | 46.104*** | 0.093 | .925 |
| Yes | 1873 | 6 | 0.560 | 0.428; 0.651 | 55.996*** | | |
| Monitoring | | | | | | | |
| No | 1878 | 7 | 0.671 | 0.426; 0.915 | 58.389*** | 2.097 | .036** |
| Yes | 1445 | 5 | 0.231 | 0.060; 0.401 | 12.614** | | |
| II format | | | | | | | |
| If-Then | 846 | 3 | 0.323 | 0.423; 0.694 | 0.575 | 1.285 | .199 |
| When, where, how | 2477 | 9 | 0.559 | 0.344; 0.773 | 99.783*** | | |

***, **, * statistically significant at the 1%, 5% and 10% levels respectively.

($Q$ = 39.930***). Although the effect size was larger for healthy individuals, the differences across groups were not statistically significant ($p$ = .153).

2. *Number of health objectives*: The two groups in this analysis were defined as follows. The first group contained studies in which the participants intended to lower their fat intake complemented by additional objectives. The effect size found in this group

was medium ($d$ = 0.420), with significant heterogeneity ($Q$ = 43.154***). The second group was comprised of studies in which the participants only intended to lower their fat intake. The effect size found in this second group was $d$ = 0.658, and there was also significant heterogeneity ($Q$ = 46.549***). Although the effect size was larger in the first group, the differences were not statistically significant ($p$ = .482).

3. *Number of interventions*: The group used to assess this factor was composed of studies with more than one psychological intervention. Its effect size was $d$ = 0.345, and non-significant heterogeneity was found ($Q$ = 3.135). The studies belonging to the other group were those with just one intervention. The effect size was larger ($d$ = 0.511), and the heterogeneity was significant. Differences across groups were not statistically significant ($p$ = .414).
4. *Initial training*: The first group used to assess this variable included those studies in which the participants did not receive an initial training to deliver knowledge about the type of food to be eaten to achieve the diet goal. The size effect was $d$ = 0.442, and there was significant heterogeneity ($Q$ = 46.104***). Group two included those studies with initial training, and its size effect was $d$ = 0.560, with significant heterogeneity ($Q$ = 55.996***). The comparison between these two groups showed non-significant differences ($p$ = .925).
5. *Monitoring*: Group one (in which the individual was not monitored by health professionals during the study) had an effect size of $d$ = 0.671, with significant heterogeneity ($Q$ = 58.389***), while group two (where the individual was monitored during the study) showed an effect size of $d$ = 0.231, with significant heterogeneity identified at the 5% level ($Q$ = 12.614**). For this factor, significant differences between the two groups were found at the 5% level ($p$ = .036**).
6. *Implementation intention format*: Studies with an 'if-then' II format showed an effect size of $d$ = 0.323 and non-significant heterogeneity. However, studies with the 'when, where, and how' II format had an effect size of $d$ = 0.559, with significant heterogeneity ($Q$ = 99.783***). For this variable, non-significant differences were found ($p$ = .199).

Additionally, we looked for possible moderator scale variables (e.g., the percentage of women, age, and study duration) with meta-regression following by the weighted least squared model method. The meta-regression testing the mediator effects of these variables was significant ($p$ = .025) with decent fit ($R^2$ = .671), and the results showed that the percentage of women in each study had a negative and significant impact on the process ($\beta = -.623$; $p$ = .025), indicating that fewer female participants resulted in a larger effect of II. None of the other variables was significant. Additionally, the possible U shape of the age–effect size relation was tested by including a quadratic term for age, which also showed a non-significant result ($p$ = .835).

## Discussion

Implementation intentions are self-regulatory strategies in which an individual plans actions in advance to facilitate the goal of automatizing his or her behaviour in certain situations.

Overall, our results contradict past studies and introduce the presence of new variables that have been overlooked in implementation intentions research. Therefore, the main contribution of this study is that it identifies new lines of research that will contribute to the existing literature of implementation intentions.

The main goal of this study was to examine the efficacy of forming implementation intentions for fat intake reduction. Some previous evidence suggested that when implementation intentions are used to reduce unwanted behaviours, such as fat intake, they tend to be less effective than when they promote desired behaviours (Adriaanse *et al.*, 2010, 2011; Hankonen *et al.*, 2013; Karimi-Shahanjarini, Rashidian, Omidvar, & Majdzadeh, 2013; Verplanken & Faes, 1999). This is because planning is less useful for breaking existing habits, such as in the case of decreasing fat intake, than it is for creating new habits, such as increasing the consumption of fruits and vegetables (Karimi-Shahanjarini *et al.*, 2013; Verplanken & Wood, 2006). However, in this meta-analysis, we found a medium effect size for forming implementation intentions for fat intake reduction ($d$ = 0.488). Hence, this result shows a higher effect for an avoidance goal than that reported by Adriaanse *et al.* (2010), where the reported effect size for similar goals was .29. One reason for these contradictory findings could be that Adriaanse measured fat and snack intake together. Despite both goals aimed at reducing an unwanted behaviour, they are different in terms of their complexity. Previous literature has discussed difficult goals (Armitage, 2004; Gollwitzer & Brandstätter, 1997; Gratton *et al.*, 2007; Kelley & Abraham, 2004; Kreausukon *et al.*, 2012; Reuter *et al.*, 2008; Verplanken & Faes, 1999), although few studies have discussed goals that are difficult due to the knowledge required for performing the behaviour to achieve the goal. Indeed, Luszczynska, Scholz, *et al.* (2007) and Luszczynska, Sobczyk, *et al.* (2007) noted that the complexity of fat intake behaviour may require a more elaborate implementation intention plan.

On the one hand, fat intake reduction is a complex goal, with many contributors to its complexity. Drawing from the literature on task complexity (Liu & Li, 2012), we consider the reduction of fat intake a complex goal for two reasons: (1) It can be achieved through different behaviours, ranging from exchanging a portion of chips for a salad to eating half of your plate instead of all of it (De Vet, 2007); and (2) a goal is complex when it requires previous knowledge in order to be achieved (Campbell, 1988). Therefore, complex goals are more abstract than simple goals, which are more concrete. For complex goals, drawing from the theory of construal level (Liberman & Wakslak, 2007; McCrea, Liberman, Trope, & Sherman, 2008), if the person thinks about a task in a concrete way instead of in abstract terms, that would affect the likelihood of completing the task because forming a concrete representation of the task will reduce the procrastination. As Gollwitzer and Sheeran (2006) reported, forming implementation intentions through a concrete plan to perform an activity enhanced the likelihood of actually undertaking the activity, relative to having more abstract, general intentions to perform the same actions. For instance, in interventions related to fat intake, participants design plans such as 'I will select low-fat options in the supermarket', reducing the abstractness of the task and, therefore, increasing the likelihood of performing the behaviour.

On the other hand, unhealthy snacking is a simple goal because it is easier to recognize when not to eat a chocolate snack. Consequently, it is an easily performed behaviour because it is concrete and does not require previous knowledge to perform and automatize. Therefore, implementation intentions will be less useful for such types of behaviours, as demonstrated in recent studies (e.g., Karimi-Shahanjarini *et al.*, 2013; Tam, Bagozzi, & Spanjol, 2010). Our findings introduce a new line of research to help understand and improve the performance of implementation intentions for different types of goals.

The present study shows the presence of two moderating variables in the implementation intentions process. First, it may be more effective to design implementation intentions to ensure goal attainment in men. However, it is difficult to compare

these results to those of other studies because this variable has been overlooked in previous implementation intention research. One plausible explanation that supports our finding was previously described by Renner *et al.* (2008); because of their motivational structure, women are more able to spontaneously translate their intentions into plans without any type of intervention. More research is required to understand and improve the efficacy of implementation intentions in women versus men.

Second, the intervention may be less efficient when there are several follow-ups during the intervention. This seems an important issue for future research, as the literature has not previously described this aspect. One possible intuitive explanation for this finding may be that monitoring assists goal achievement in both the experimental and control groups. That is, receiving any type of support during the study (letters, telephone calls, or just an assessment of results) can help all participants resolve questions or doubts about what they are expected to do before finishing the study, and this support may also have worked as a reminder that participants were expected to take some action (i.e., reduce their fat intake). This periodical reminder may improve the results among all participants, resulting in the planning intervention appearing less effective. Indeed, past research in self-regulation theory affirms that there are some mechanisms of regulatory cognitive processes that facilitate goal achievement, including the monitoring and evaluation of progress towards the goal (Ford & Nichols, 1991).

There is abundant room for further progress in determining the relationship between goal complexity, as a moderating variable, and implementation intentions efficacy. Research can now proceed to test the proposed causal mechanisms by which the intervention works. In future investigations, it might be possible to test the results of formulating a complex goal versus a simple goal, both of them focused on achieving the same healthy eating behaviour.

To develop a full picture of implementation intentions mechanisms, additional studies will be needed that focus on other aspects, such as how affective factors can influence the efficacy of implementation intentions. Adriaanse *et al.* (2009) found that not only external cues but also internal motivational cues can be used in the if-part of implementation intentions (such as to be social, feeling bored, or enjoyment among others). Further work is required to establish how emotional eating and affective factors influence implementation intentions.

From the Transformative Consumer Research perspective, conducting practical research that can be used by policymakers to increase the wellbeing of consumer citizens is important (Mick, 2006; Ozanne *et al.*, 2011). In this particular case, we describe implications for the design and development of health promotion interventions and communication messages to reduce fat intake, one of the most important behaviours that can be changed to improve healthy eating. In the light of our results, we conclude that to increase effectiveness, health campaigns should encourage the target audience to make specific plans to reduce their fat intake, as forming implementation intentions seems to be effective in the design of health interventions, specifically for men.

## Conflict of interest

No potential conflict of interest was reported by the authors.

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## Supporting Information

The following supporting information may be found in the online edition of the article:

**Appendix S1.** Prisma check list.