

Combining Self-Affirmation and Implementation Intentions: Evidence of Detrimental Effects on Behavioral Outcomes

Donna C. Jessop, Ph.D · Paul Sparks, Ph.D ·
Nicola Buckland, BSc · Peter R. Harris, Ph.D ·
Sue Churchill, Ph.D

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Abstract

Background There is limited evidence that self-affirmation manipulations can promote health behavior change.

Purpose The purpose of this study was to explore whether the efficacy of a self-affirmation manipulation at promoting exercise could be enhanced by an implementation intention intervention.

Methods Participants (Study 1 $N=120$, Study 2 $N=116$) were allocated to one of four conditions resulting from the two (self-affirmation manipulation: no affirmation, affirmation) by two (implementation intention manipulation: no implementation intention, implementation intention) experimental design. Exercise behavior was assessed 1 week post-intervention.

Results Contrary to prediction, those participants receiving both manipulations were significantly *less* likely to increase the amount they exercised compared to those receiving only the self-affirmation manipulation.

Conclusion Incorporating an implementation intention manipulation alongside a self-affirmation manipulation had a detrimental effect on exercise behavior; participants receiving both manipulations exercised significantly less in the week following the intervention.

Keywords · Self-affirmation · Implementation intentions ·
Health-risk information · Exercise

D. C. Jessop (✉) · P. Sparks · N. Buckland · P. R. Harris
School of Psychology, Pevensey 1, University of Sussex, Falmer,
Brighton, BN1 9QH, UK
e-mail: d.jessop@sussex.ac.uk

S. Churchill
Department of Psychology and Counselling, University
of Chichester, Chichester, PO19 6PE, UK

A major challenge facing health promoters is the tendency for people to process personally relevant health-risk information defensively [1–3]. Indeed, people at whom health promotion messages are directed (e.g., those who engage in a particular health-detrimental behavior) have been shown to be the most likely to derogate the message [1] and the least likely to be persuaded by it [2].

Self-affirmation theory

Such defensive processing can be explained from the perspective of self-affirmation theory [4]. According to self-affirmation theory, people are continually motivated to protect their self-integrity, where the latter has been described as the belief that the self is “adaptively and morally adequate, that is, competent, good, coherent, unitary, stable, capable of free choice, capable of controlling important outcomes...” (4, p. 262). Information detailing the health-detrimental consequences of a person's chosen behaviors may present a threat to self-integrity, insofar as such information questions the extent to which (s)he can be considered as “competent” and “capable of controlling important outcomes”, and hence as someone who would not deliberately engage in behavior that is harmful to the self. Consequently, the desire to defend self-integrity may promote defensive processing of personally relevant health-risk information as a means of preserving one's sense of self as a competent and healthy individual [5].

Critically, however, self-affirmation theory contends that potential threats to self-integrity can be countered by affirming the self in an important domain [4]. Thus, if individuals are given the opportunity to reflect on a positive source of self-integrity, this should allow them to maintain their overall sense of self-integrity in the face of personally relevant health-risk information. As a result, they should be better disposed to consider such information without engaging in

defensive processing [3]. Accordingly, self-affirmation theory predicts that affirming the self should allow individuals to respond to personally relevant health-risk information in a more open and less biased manner, rendering them more susceptible to persuasion and, ultimately, behavior change.

A growing body of evidence supports the proposition that self-affirmation manipulations can facilitate more open-minded processing of personally relevant health-risk information [6]. Encouragingly, from a health promotion perspective, research findings suggest that self-affirmation can have a positive influence on cognitive precursors of behavior change, with self-affirmed higher-risk participants reporting more positive cognitions on a variety of indices after exposure to threatening information about the health-related behavior in question compared to their non-affirmed counterparts. For example, self-affirmation manipulations have been found to generate stronger intentions to reduce alcohol consumption [7], heightened control, self-efficacy and intentions to reduce the number of cigarettes smoked [8], stronger intentions to quit smoking [9], greater levels of response efficacy and self-efficacy regarding the consumption of five portions of fruit and vegetables a day [10], more positive attitudes and intentions, along with higher response- and self-efficacy, about sunscreen use [11], and more positive intentions to take an online type 2 diabetes risk test [12].

Evidence that self-affirmation manipulations can promote behavior change per se has been less forthcoming, however. While there is some indication that self-affirmation can lead to immediate behavioral effects within the experimental setting [9, 11, 12], measures of behavior at follow-up have often failed to demonstrate any impact of self-affirmation on behavior change. For example, self-affirmation manipulations have been found to have no effects on alcohol consumption reported 1 week and 1 month post manipulation [7] or cigarette consumption reported 1 week post manipulation [8]. Indeed, to date, only two published studies have documented any effects of self-affirmation on the targeted behavior assessed outside the experimental setting. Specifically, Epton and Harris [10] found that self-affirmed participants reported consuming significantly more fruit and vegetables in the week following the manipulation, and Armitage et al. [13] found that self-affirmed participants reported reduced alcohol consumption at 1 month follow-up.

Thus, while self-affirmation manipulations hold promise from a health promotion perspective, insofar as they are able to influence key cognitive precursors of health behavior change such as intentions, there is limited evidence that these motivational changes translate into behavior. Hence, Harris and Epton [6] propose that self-affirmation manipulations may be best regarded as interventions at the *motivational* stage rather than the *volitional* stage [14]. In other words, it is possible that affirmation manipulations are effective at exerting an influence at the motivational stage, insofar as they

increase message acceptance and thus precipitate positive changes in cognitive precursors of behavior such as intentions. Affirmation manipulations may fall short at the volitional stage, however, as they fail to facilitate the translation of such positive motivations into behavior. As such, it seems plausible that the effectiveness of self-affirmation manipulations at promoting health behavior change might be enhanced by their being coupled with an intervention specifically targeting the volitional stage.

Implementation Intentions

One technique that has been shown to be effective at increasing the likelihood that positive motivations translate into goal-directed behavior is the formation of implementation intentions. Implementation intentions provide an action plan for behavior change that specifies when, where and how goal-directed responses will occur. Thus implementation intentions link a specified situation to the intended goal-directed response, such that “if situation X occurs, then I will engage in behavior Y” [15, 16].

Two processes are believed to underpin the impact of implementation intentions on behavior [15, 16]. First, it is contended that the mental representation of the external cue (i.e., the specified situation) becomes highly accessible, with the result that suitable opportunities to act are more easily detected. Second, the formation of the implementation intention is thought to strengthen the association between the external cue and the goal-directed response. Thus, it is contended that subsequent encounters with the specified situation will trigger the automatic activation of the goal-directed response. Consequently, the formation of implementation intentions is held to increase the likelihood of goal achievement because minimal conscious thought and effort is needed to initiate the behavior [15, 17].

Implementation intention formation has been shown to enhance the performance of a variety of health promoting behaviors. For example, compared to controls, participants who formed implementation intentions have been found to be more likely to exercise [18], reduce alcohol consumption [19], increase fruit and vegetable consumption [20], and reduce snack consumption [21]. Indeed, a meta-analysis of 94 studies revealed that implementation intention formation had a medium to large effect ($d_+=0.65$) on goal attainment [22]. However, it is noteworthy that some studies have reported no impact of implementation intentions on behavior [23–25].

Self-Affirmation and Implementation Intentions

In light of the above, it seems reasonable to hypothesize that the inclusion of an implementation intention intervention

alongside a self-affirmation manipulation would boost the effectiveness of the latter at promoting health behavior change, as the implementation intention intervention should facilitate the translation of any positive motivations fostered by self-affirmation into action [6, 26]. Research centered in other theoretical frameworks supports this contention, with findings showing that combining interventions targeting the motivational stage with implementation intention interventions results in greater behavior change than motivational interventions used in isolation [27, 28].

To our knowledge, only two studies have previously linked self-affirmation and implementation intentions in any manner. Armitage et al. [13] demonstrated that a self-affirmation manipulation could take the format of an implementation intention task; participants in the resultant self-affirmation condition were asked to make plans such as: “If I feel threatened or anxious then I will think about the things I value about myself”. In a different vein, Ferrer et al. [29] investigated whether self-affirmation facilitated the formation of goal-directed plans. Their findings indicated that participants who had been self-affirmed volunteered more detailed plans in response to a question asking them to list any steps they would take to reduce their alcohol consumption. Critically, however, no published research to date has explored whether the efficacy of a self-affirmation manipulation at promoting health behavior change could be enhanced by the inclusion of an implementation intention intervention, where individuals formulate goal-directed plans regarding the target health-related behavior. This would appear to be a notable omission in the literature and it is one that the current studies seek to address.

The Present Research

This paper reports two studies designed to test whether the inclusion of an implementation intention intervention would increase the effectiveness of a self-affirmation manipulation at promoting exercise behavior. Exercise represents a salient health issue, with the majority of people in the US leading a sedentary lifestyle [30]. Similarly, in the UK, the majority of individuals take insufficient exercise [31], with potentially severe consequences for their health [32].

Consistent with previous research findings [6], it was predicted that self-affirmed participants would report more positive cognitions towards increasing the amount they exercised compared to their non-affirmed counterparts. Moreover, in terms of behavioral outcomes, it was predicted that the implementation intention manipulation would augment any impact of the self-affirmation manipulation on exercise behavior. Specifically, it was hypothesized that participants who received both the self-affirmation manipulation and the implementation intention manipulation would be more likely to

increase the amount they exercised compared to those who received only the self-affirmation manipulation.

Study 1

Method

Design and Procedure Study 1 employed a 2 (self-affirmation manipulation: no affirmation, affirmation) × 2 (implementation intention manipulation: no implementation intention, implementation intention) prospective experimental design. At Time 1, participants completed a measure of baseline exercise behavior. They were then exposed to either the self-affirmation manipulation or a matched control task, prior to reading information detailing the consequences of engaging in insufficient exercise. Participants then completed measures of attitude, perceived behavioral control, response efficacy, and intention regarding increasing the amount they exercised. Those in the implementation intention conditions subsequently completed an implementation intention task. Exercise behavior was again assessed at 1 week follow-up (Time 2).

Participants were recruited opportunistically via a message sent to contacts of one of the researchers and posted on the social network site *Facebook*. Recipients of this information were also asked to forward the message to any of their contacts they thought might be interested in participating. The message contained the web link to the Time 1 questionnaire. Participants who clicked on this link were randomly allocated to one of four conditions arising from the 2 × 2 design.

Participants who provided their e-mail addresses at Time 1 were sent the web link to the Time 2 questionnaire 7 days later and asked to complete this as soon as possible. As an incentive to participate and to deter attrition, participants who completed both questionnaires were entered into a cash prize draw.

Participants One hundred and twenty participants completed the Time 1 questionnaire acceptably¹; 47 (39.17 %) were students, 88 (73.33 %) were female. Ages ranged from 19 to 52 years ($M=25.02$, $SD=6.87$).

Ninety-one participants responded at Time 2, representing an attrition rate of 24.17 %. One-way ANOVAs and chi-

¹ From an original sample of 130, one person's data were deleted as identity checks revealed that (s)he had completed this questionnaire twice, and one person's data were deleted as the health-risk information check (see below) failed to confirm that the health-risk information had been read. Seven further people in the implementation intention conditions omitted to form implementation intentions, and their data were also removed from the data set. Lastly, one person in the affirmation conditions responded in the affirmative to fewer than half of the affirmation items (see below). As it is unlikely that this participant had been affirmed, his/her data were also removed from the data set.

square analyses revealed no differences between Time 2 respondents and non-respondents in terms of gender, $\chi^2(1, N=120)=0.37, p=0.54$, Cramér's $V=0.06$, student status, $\chi^2(1, N=120)=0.08, p=0.78$, Cramér's $V=0.03$, age, $F(1, 118)=0.05, p=0.82, \eta^2=0.00$, the amount of times exercised in the past 7 days, $F(1, 118)=2.17, p=0.14, \eta^2=0.02$, or condition, $\chi^2(3, N=120)=2.56, p=0.46$, Cramér's $V=0.15$.

The numbers of participants in each condition were as follows: no affirmation and no implementation intention, Time 1 $n=45$, Time 2 $n=35$; affirmation and no implementation intention, Time 1 $n=22$, Time 2 $n=19$; no affirmation and implementation intention, Time 1 $n=28$, Time 2 $n=20$; affirmation and implementation intention, Time 1 $n=25$, Time 2 $n=17$.

Materials

Time 1 Questionnaire

At Time 1, participants completed a questionnaire including the following sections.

Demographic Information

Participants were asked to indicate their age, gender, and student status.

Baseline Behavior

Participants were informed that for the purposes of the current study exercise was defined as “any moderate to vigorous physical activity, performed in your leisure time, that raises your heart rate, and results in you becoming warm and at least mildly out of breath”. Participants were subsequently asked to respond to the following question: “In the past seven days on how many days have you engaged in 30 minutes or more of exercise?”.

Self-Affirmation Manipulation

Following Reed and Aspinwall [3], participants in the affirmation conditions were asked to indicate whether they had performed each of ten kindness behaviors, e.g., “Have you ever been considerate of another person's feelings?” (*yes/no*). If they responded in the affirmative, a brief space was provided for them to give an example. Participants in the no affirmation conditions were asked to respond to ten parallel questions about relatively neutral topics, e.g., “I think that the most aromatic trees in the world are pine trees”. If they responded in the affirmative, a brief space was provided for them to explain why.

Health-Risk Information

All participants were subsequently presented with information about exercise. This information was displayed on three separate pages of the online questionnaire. The first page was entitled “Risks of not exercising” and highlighted various health-related consequences of failing to engage in sufficient exercise, including being at increased risk of colon cancer, breast cancer, cardiovascular disease and premature death. The second page presented information about how to incorporate exercise into one's life easily and inexpensively and gave examples of suitable activities. The third page informed participants that by engaging in 30 min of exercise every day they could reduce their risk of serious illness and improve their quality of life.

Health-Risk Information Check

To ensure participants had read the health-risk information, on the next page of the online questionnaire they were asked to describe the broad content of the information they had just read.

Cognitive Precursors of Behavior Change

Participants were next asked to complete a number of items assessing each of the following cognitive precursors of behavior change. Unless otherwise indicated, responses to these items were given on seven-point scales ranging from *strongly disagree* [1] to *strongly agree* [7].

Attitude

Attitudes towards increasing the amount they exercised were assessed by asking them to respond to the statement “For me to increase the amount I exercise by one extra session (30 minutes or more) over the next 7 days would be:” on three pairs of semantic differentials (*extremely bad* [1] to *extremely good* [7], *extremely harmful* [1] to *extremely beneficial* [7] and *extremely worthless* [1] to *extremely valuable* [7]), $\alpha=0.80$.

Perceived Behavioral Control

Perceived behavioral control was measured by three items, e.g., “If I wanted to I could increase the amount I exercise by one extra session of exercise (30 minutes or more) over the next 7 days”, $\alpha=0.85$.

Response Efficacy

Beliefs in the effectiveness of increasing the amount they exercised for improving their health were assessed by two

items, e.g., “If I increase the amount I exercise by one extra session of exercise (30 minutes or more) over the next 7 days it will improve my health”, $r(118)=0.65, p<0.001$.

Intention

Intentions towards increasing the amount they exercised were assessed by three items (e.g., “I intend to increase the amount I exercise by one extra session of exercise [30 minutes or more] over the next 7 days”), $\alpha=0.92$.

Implementation Intention Manipulation

For participants in the no implementation intention conditions, the questionnaire ended after the assessment of the variables described above. By contrast, following Milne et al. [27], participants in the implementation intention conditions were next asked to read the following statement:

Many people find that they intend to increase the amount they exercise by one extra session of exercise (30 minutes or more) over the next 7 days but then forget to, or ‘never get around to it’. You are more likely to increase the amount you exercise if you make a decision about *what* form of exercise you will engage in and *when* and *where* you will do so. For example, you may go for a run on Tuesday evening, attend an aerobics class at a fitness centre in your Thursday lunch break or go swimming at a sports centre on Saturday morning. Before you answer the next few questions, please think about *how* you will increase the amount you exercise by one extra session of exercise (30 minutes or more) over the next 7 days and *when* and *where* you will do this.

Participants were then asked to specify *what* form of exercise they were going to engage in over the next 7 days to increase the amount they exercised by one extra session and to state *where* and *when* they would perform this extra session of exercise. They were then asked to use the responses that they had just given to complete the following sentence:

When it gets to _____
(please enter in the space provided above the day and time you plan to exercise)
I will _____
(please enter in the space provided above where you will go and what exercise you will engage in).

Participants were asked to repeat the resultant sentence to themselves three times, as it has been claimed that mental rehearsal enhances the effectiveness of context-linked plans [33].

Time 2 Questionnaire

At Time 2 participants completed a questionnaire including the following section.

Exercise Behavior

Participants were reminded of the definition of exercise presented at Time 1. Subsequently, participants were asked to quantify the number of days on which they had engaged in 30 min or more of exercise over the preceding 7 day period using the same question as at Time 1 (“In the past seven days on how many days have you engaged in 30 minutes or more of exercise?”).

Results

At Time 1, the mean number of days on which participants reported having exercised in the past week was 2.72 ($SD=1.92$; range 0–7).

Preliminary analyses revealed no pre-intervention differences between conditions on any of the baseline variables assessed prior to the self-affirmation manipulation. Specifically, chi-square analyses revealed no differences between conditions in terms of gender or student status and analyses of variance revealed no differences between conditions in terms of age or the number of times exercised in the past 7 days (all $ps>0.15$).

The Impact of the Self-Affirmation Manipulation on Cognitions

To determine the impact of the self-affirmation manipulation on cognitive precursors of behavior change reported at Time 1, a series of one-way ANOVAs was conducted, with self-affirmation manipulation (no affirmation, affirmation) as the factor and each of the following variables entered in turn as the dependent variable: attitude, perceived behavioral control, response efficacy and intention. The resultant analyses are summarized in Table 1. It can be seen that self-affirmed participants reported more positive attitudes, higher levels of response efficacy and marginally greater perceptions of control than did their non-affirmed counterparts.

Moderated regression analyses revealed no significant interactions between baseline exercise behavior and self-affirmation manipulation on any cognitive outcomes, all $\beta s < |0.12|$, $ps>0.30$; thus, there was no evidence that baseline behavior moderated any impact of the self-affirmation manipulation on cognitions.

Table 1 Summary of one-way ANOVAs comparing participants in the no affirmation and affirmation conditions on measures of cognition, Study 1

	No affirmation <i>M (SD)</i>	Affirmation <i>M (SD)</i>	<i>F</i>	η^2
Attitude	5.67 (0.97)	6.04 (0.67)	5.21*	0.04
Perceived behavioral control	5.42 (1.35)	5.82 (1.13)	2.95 [†]	0.02
Response efficacy	5.41 (1.15)	5.93 (0.89)	6.79*	0.05
Intentions	4.74 (1.28)	4.82 (1.40)	0.08	0.00

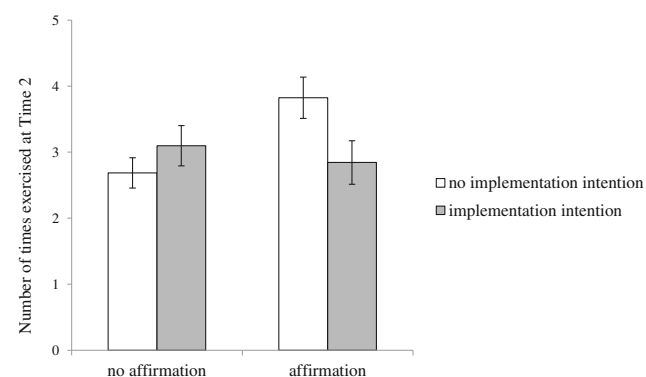
$df=1, 118$

* $p<0.05$; [†] $p<0.10$

The Impact of the Self-Affirmation Manipulation and Implementation Intention Manipulation on Exercise Behavior

In order to explore whether the self-affirmation manipulation and/or implementation intention manipulation resulted in any change in exercise behavior at follow-up, a 2 (self-affirmation manipulation: no affirmation, affirmation) \times 2 (implementation intention manipulation: no implementation intention, implementation intention) ANCOVA was conducted, with the number of times exercised over the past 7 days at Time 2 as the dependent variable and the number of times the participant reported having exercised over the past 7 days at Time 1 entered as a covariate. This analysis revealed no significant main effect of either the self-affirmation manipulation, $F(1, 86)=2.19, p=0.14, \eta^2=0.02$, or the implementation intention manipulation, $F(1, 86)=0.93, p=0.34, \eta^2=0.01$. There was however, a significant interaction effect, $F(1, 86)=5.55, p=0.02, \eta^2=0.06$ (see Fig. 1).

Simple main effects analyses revealed a significant effect of the self-affirmation manipulation for participants in the no



Note: marginal means calculated at baseline exercise behavior = 2.57

Fig. 1 Marginal means (and SEM) for number of times exercised at follow-up as a function of affirmation and implementation intention controlling for baseline exercise behavior, Study 1

implementation intention conditions, $F(1, 86)=8.62, p=0.004, \eta^2=0.09$, reflecting the fact that self-affirmed participants were more likely to have increased the number of times exercised at follow-up than were non-affirmed participants (marginal means: 3.82 and 2.69, respectively). There was no effect of the self-affirmation manipulation for participants in the implementation intention conditions, $F(1, 86)=0.32, p=0.58, \eta^2=0.00$.

Further simple main effects analyses revealed no effect of the implementation intention manipulation for participants in the no affirmation conditions, $F(1, 86)=1.17, p=0.28, \eta^2=0.01$. There was, however, a significant effect of the implementation intention manipulation for participants in the affirmation conditions, $F(1, 86)=4.70, p=0.03, \eta^2=0.05$, with participants who received both the implementation intention manipulation and the self-affirmation manipulation being less likely to have increased the number of times exercised at follow-up compared to those who had received only the self-affirmation manipulation (marginal means: 2.84 and 3.82, respectively).

Discussion

Study 1 provided no support for the prediction that an implementation intention manipulation would improve the effectiveness of a self-affirmation manipulation at promoting behavior change. Indeed, contrary to prediction, participants receiving both manipulations were significantly less likely to have increased the amount they exercised at follow-up compared to those receiving the self-affirmation manipulation alone.

One possible explanation for this unexpected finding is that the self-affirmed participants were more likely to set unrealistic behavioral goals when forming implementation intentions; hence the formation of such goals might actually have hindered rather than facilitated goal attainment. To test this possibility, two independent adjudicators (who were blind to both condition and study aims) rated the contingent plans that participants in the implementation intention conditions made in terms of how complex, realistic, and achievable they were. Independent samples *t* tests revealed no significant differences between self-affirmed and non-affirmed participants' plans on any of these indices ($ps>0.18$).

Alternatively, it is possible that self-affirmed participants may have been somewhat demotivated by the suggestion that they would need to formulate detailed plans in order to achieve their goals. Indeed, this suggestion (and the subsequent formation of implementation intentions) may have undermined any heightened sense of capability and/or motivation induced by the self-affirmation manipulation and hence reduced the effectiveness of this latter manipulation at promoting behavior change.

Study 2

In light of this latter possibility, a second study was conducted. This study utilized the same experimental design as Study 1, but employed a simpler and shorter implementation intention manipulation that did not require participants to formulate detailed plans. More specifically, Study 2 used a goal shielding implementation intention manipulation [21]. Study 2 also focused on “low exercisers”, defined as those performing fewer than the recommended five weekly sessions (30 min or more) of moderate exercise in the average week [31], as these individuals represent those most in need of effective behavioral intervention. Moreover, low exercisers should be more likely to respond defensively to information detailing the consequences of engaging in insufficient exercise [2]. Consequently, the potential for self-affirmation to promote open-minded processing of such information might be enhanced for these individuals [7].

Method

Design and Procedure

Study 2 employed a 2 (self-affirmation manipulation: no affirmation, affirmation) \times 2 (implementation intention manipulation: no implementation intention, implementation intention) prospective experimental design. Participants completed the Time 1 measures and experimental manipulations in the same order as Study 1; the Time 2 questionnaire was administered at 1 week follow-up.

Undergraduate students at a UK university were asked to take part in a study exploring their beliefs about exercise behavior. Those who consented to take part completed the Time 1 questionnaire at the start of a lecture or seminar under exam conditions. Participants were sequentially allocated to one of four conditions arising from the 2 \times 2 design. Participants completed the Time 2 questionnaires 1 week later under the same conditions. As an incentive to participate and to deter attrition, participants who completed both questionnaires were entered into a cash prize draw.

Participants

One hundred and sixteen undergraduate students at a UK university, who met the inclusion criterion that they exercised on average fewer than five times per week, completed the Time 1 questionnaire acceptably²; 60 (51.72 %) were female. Ages ranged from 18 to 55 years ($M=20.65$, $SD=4.72$).

² From an original sample of 128, data from 8 people were deleted as their responses to the health-risk information check (see below) failed to confirm that they had read this information. Three people in the implementation intention conditions did not complete the implementation intentions task and one person in the affirmation conditions responded in the affirmative to fewer than half of the affirmation items (see below). These participants' data were also removed from the final data set.

Ninety-seven participants responded at Time 2, representing an attrition rate of 16.38 %. One-way ANOVAs and chi-square analyses revealed no differences between Time 2 respondents and non-respondents in terms of gender, $\chi^2(1, N=116)=0.84$, $p=0.36$, Cramér's $V=0.09$, age, $F(1, 114)=0.94$, $p=0.33$, $\eta^2=0.01$, the amount of times exercised in the past 7 days, $F(1, 114)=0.02$, $p=0.88$, $\eta^2=0.00$, or condition, $\chi^2(3, N=116)=1.66$, $p=0.65$, Cramér's $V=0.12$.

The numbers of participants in each condition were as follows: no affirmation and no implementation intention, Time 1 $n=32$, Time 2 $n=27$; affirmation and no implementation intention, Time 1 $n=29$, Time 2 $n=26$; no affirmation and implementation intention, Time 1 $n=31$, Time 2 $n=24$; affirmation and implementation intention, Time 1 $n=24$, Time 2 $n=20$.

Materials

Time 1 Questionnaire

At Time 1, participants completed a questionnaire including the following sections:

Demographic Information

Participants were asked to indicate their age and gender.

Baseline Behavior

The measure of baseline behavior was identical to that used in Study 1.

Self-Affirmation Manipulation

The self-affirmation manipulation was identical to that used in Study 1.

Health-Risk Information

All participants were subsequently asked to read the same information about exercise as in Study 1. In Study 2, however, the following statement was presented at the end of the exercise-related information: “We would like you to increase the amount you exercise by at least one extra session (30 minutes or more) over the next 7 days”. This extra statement was presented to all participants; its inclusion was necessary in order that the implementation intention task made sense to those in the implementation intention conditions (see below).

Health-Risk Information Check

The health-risk information check was identical to that used in Study 1.

Cognitive Precursors of Behavior Change

Participants were next asked to complete the same measures of attitude, perceived behavioral control, response efficacy and intentions as in Study 1; the only difference being that the items in Study 2 referred to the target behavior of increasing the amount exercised by *at least* one extra session, in order to be compatible with the health-risk information. This change conferred the additional benefit that the resultant measures should better reflect the cognitions of those motivated to do *more* than one extra session of exercise in the coming week, which may not have been optimally tapped by the measures of cognition employed in Study 1. All scales were found to have acceptable internal reliability, $\alpha_s > 0.76$; $r_s > 0.77$.

Implementation Intention Manipulation

For participants in the no implementation intention conditions, the questionnaire ended after the assessment of the variables described above. By contrast, following Achtziger et al. [21], participants in the implementation intention conditions were asked to repeat the following sentence to themselves three times and commit themselves to acting on it:

And if I think about NOT doing at least one extra session of exercise over the next 7 days, then I will ignore this thought

They were asked to tick a box confirming that they had completed this task and said the sentence to themselves three times.

Time 2 Questionnaire

At Time 2, participants completed an identical questionnaire to that used in Study 1, assessing their exercise behavior at follow-up.

Results

At Time 1, the mean number of days on which participants reported having exercised in the past week was 2.31 ($SD = 1.50$; range 0–7³).

Chi-square analysis revealed no pre-intervention differences between conditions in terms of gender and analysis of variance revealed no pre-intervention differences between conditions in the number of times exercised in the past 7 days ($p_s > 0.13$). There was, however, a significant difference in age

between conditions, with participants in the affirmation conditions being older than those in the no affirmation conditions, $F(1, 112) = 3.85$, $p = 0.052$, $\eta^2 = 0.03$, $M_s = 21.58$ and 19.86, respectively.

The Impact of the Self-Affirmation Manipulation on Cognitions

To determine the impact of the self-affirmation manipulation on cognitive precursors of behavior change reported at Time 1, a series of one-way ANOVAs was conducted with self-affirmation manipulation (no affirmation, affirmation) as the factor and each of the following variables entered in turn as the dependent variable: attitude, perceived behavioral control, response efficacy and intention. The resultant analyses are summarized in Table 2. While all of the mean differences were in the predicted direction, none of these reached statistical significance. Including age as a covariate did not change the pattern of results.

Moderated regression analyses revealed no significant interactions between baseline exercise behavior and self-affirmation manipulation on any cognitive outcomes, all $\beta_s < |0.10|$, $p_s > 0.43$; thus, there was no evidence that baseline behavior moderated any impact of the self-affirmation manipulation on cognitions.

The Impact of the Self-Affirmation Manipulation and Implementation Intention Manipulation on Exercise Behavior

In order to explore whether the self-affirmation manipulation and/or implementation intention manipulation resulted in any change in exercise behavior at follow-up, a 2 (self-affirmation manipulation: no affirmation, affirmation) \times 2 (implementation intention manipulation: no implementation intention, implementation intention) ANCOVA was conducted, with the number of times participants reported having exercise over the past 7 days at Time 2 as the dependent variable and the number of times participant reported having exercised over the past 7 days at Time 1 entered as a covariate. This analysis

Table 2 Summary of one-way ANOVAs comparing participants in the no affirmation and affirmation conditions on measures of cognition, Study 2

	No affirmation <i>M (SD)</i>	Affirmation <i>M (SD)</i>	<i>F</i>	η^2
Attitude	5.69 (0.84)	5.76 (0.85)	0.19	0.00
Perceived behavioral control	5.64 (0.99)	5.86 (0.87)	1.62	0.01
Response efficacy	5.45 (1.23)	5.59 (1.14)	0.41	0.00
Intentions	4.88 (1.41)	5.11 (1.46)	0.74	0.01

$df = 1, 114$

³ While all participants had indicated that they exercised on fewer than 5 days a week *in the average week*, 7 participants had nonetheless exercised on 5 or more days in the previous 7 day period.

revealed no significant main effect of either the self-affirmation manipulation, $F(1, 92)=2.25, p=0.14, \eta^2=0.02$, or the implementation intention manipulation, $F(1, 92)=1.44, p=0.23, \eta^2=0.02$. There was however, as in Study 1, a significant interaction effect, $F(1, 92)=3.91, p=0.05, \eta^2=0.04$ (see Fig. 2).

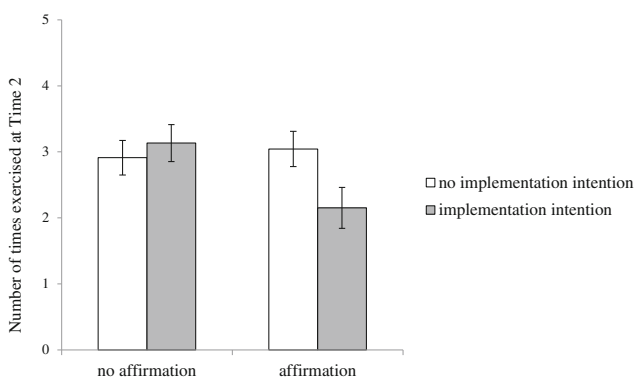
Simple main effects analyses revealed no significant effect of the self-affirmation manipulation for participants in the no implementation intention conditions, $F(1, 92)=0.12, p=0.73, \eta^2=0.00$. There was, however, an effect of the self-affirmation manipulation for participants in the implementation intention conditions, $F(1, 92)=5.38, p=0.02, \eta^2=0.06$, reflecting the fact that participants receiving both manipulations were *less* likely to have increased the number of times exercised at follow-up than were those receiving only the implementation intention manipulation (marginal means: 2.15 and 3.13, respectively).

Further simple main effects analyses revealed no effect of the implementation intention manipulation for participants in the no affirmation conditions, $F(1, 92)=0.33, p=0.56, \eta^2=0.00$. There was, however, a significant effect of the implementation intention manipulation for participants in the affirmation conditions, $F(1, 92)=4.75, p=0.03, \eta^2=0.05$, with participants who received both the implementation intention manipulation and the self-affirmation manipulation being *less* likely to have increased the number of times exercised at follow-up compared to those who had received only the self-affirmation manipulation (marginal means: 2.15 and 3.04, respectively).

Including age as a covariate did not alter the pattern of results.

Discussion

Critically, Study 2 replicated the unanticipated finding of Study 1 that participants receiving an implementation intention



Note: marginal means calculated at baseline exercise behavior = 2.32

Fig. 2 Marginal means (and SEM) for number of times exercised at follow-up as a function of affirmation and implementation intention controlling for baseline exercise behavior, Study 2

manipulation alongside a self-affirmation manipulation were significantly *less* likely to increase the amount they exercised at follow-up compared to those receiving only the self-affirmation manipulation. This effect held despite the fact that Study 2 employed a shorter implementation intention task, which did not require participants to formulate detailed plans.

General Discussion

The findings fail to support the prediction that the inclusion of an implementation intention manipulation would improve the efficacy of a self-affirmation manipulation at promoting health behavior change. Instead, in both studies, participants who received an implementation intention manipulation in conjunction with a self-affirmation manipulation were significantly *less* likely to increase the amount they exercised compared to those who received only a self-affirmation manipulation. Contrary to prediction, therefore, the findings suggest that incorporating an implementation intention manipulation alongside a self-affirmation manipulation might actually be detrimental to behavioral outcomes.

The apparent negative impact of coupling an implementation intention intervention with a self-affirmation manipulation was evident irrespective of whether the implementation intention manipulation itself was relatively lengthy and required participants to formulate detailed plans (Study 1) or whether it comprised a comparatively brief goal shielding implementation intention task (Study 2). Therefore, it would appear that it is not the formation of detailed plans in itself that is detrimental to the performance of an implementation intention intervention in such contexts.

The present studies are the first to explore the effectiveness of combining an implementation intention intervention with a self-affirmation manipulation and their findings run counter to the previously documented behavioral benefits of combining motivational interventions with implementation intention interventions [27, 28].

One explanation for the unexpected impact of combining self-affirmation and implementation intentions pertains to the influence of self-affirmation on construal level [34, 35]. Self-affirmation has been shown to result in individuals being oriented towards high level construal. For example, Wakslak and Trope [35] demonstrated that self-affirmed participants displayed increased preference for identifying an action (e.g., locking a door) in terms of its superordinate aim (e.g., securing the house) rather than the underlying process (e.g., turning a key in the lock). Schmeichel and Vohs [34] replicated this finding and further demonstrated that combining a self-affirmation manipulation with a low-level construal task undermined the efficacy of the self-affirmation manipulation at reducing ego depletion. Implementation intentions, by their very nature, focus on low-level construal (e.g., the processes

underlying goal attainment, such as describing how one will increase the amount exercised) rather than high level construal (e.g., the superordinate goal of improving one's health). As such they may be incompatible with, and undermine the efficacy of, self-affirmation manipulations. This represents an intriguing avenue for future research.

An alternative explanation relates to the impact of self-affirmation on information processing. Research findings suggest that self-affirmation might encourage central processing, with attendant implications for message elaboration [36]. Completing an implementation intention manipulation could potentially disturb such processing and hence interrupt the pathway to persuasion and, ultimately, behavior change.⁴

The findings of the present research also contribute to the growing body of literature exploring the effects of self-affirmation manipulations on message acceptance and behavior change in health-related contexts. Thus, the findings provide some qualified support for the prediction that a self-affirmation manipulation would lead to greater acceptance of a message detailing the health-related benefits of exercise. Notably, self-affirmed participants in Study 1 reported more positive attitudes, higher levels of response efficacy and marginally greater perceptions of behavioral control regarding increasing the amount they exercised relative to their non-affirmed counterparts. These findings were not replicated in Study 2, however; while the patterns of means were in the predicted direction, none of these trends reached statistical significance.

Furthermore, it is noteworthy in Study 1 that those participants receiving only the self-affirmation manipulation were significantly more likely to have increased the amount they exercised than those receiving no intervention. This finding needs to be interpreted with some caution, given the fact that it was not replicated in Study 2. Nonetheless, it represents just the third demonstration of a self-affirmation manipulation resulting in health behavior change assessed at follow-up (see also [10, 13]).

The current studies found no evidence that the formation of implementation intentions alone promoted exercise behavior change. Thus, in both studies, participants receiving only the implementation intention manipulation did not differ significantly from those receiving no intervention in terms of exercise behavior at follow-up (see also [23–25]). One explanation for these null findings could be that participants' intentions to increase the amount they exercised were not sufficiently strong [37].

One limitation to the present research is the reliance on a self-report measure of behavior. While there is evidence supporting

the validity of self-report measures of exercise behavior [38, 39], it would be prudent for future research to supplement such self-report measures with more objective measures of physical activity. A second limitation concerns the generalizability of the findings. In particular, the samples used were not representative of the general population and both studies focused exclusively on one health-related behavior. Furthermore, in both studies, cell sizes at Time 2 were relatively small. Future research would benefit from utilizing larger stratified samples and should explore whether the findings reported here extend to other behavioral domains.

In summary, the current research provides the first test of combining self-affirmation manipulations and implementation intention manipulations. Critically, the findings demonstrate that the juxtaposition of these interventions is not necessarily advantageous. Future research should continue to strive to identify ways in which the effectiveness of self-affirmation manipulations at promoting health behavior change can be maximized, in order that the potential benefits of self-affirmation for health promotion can be realized.

Conflict of Interest Statement The authors have no conflict of interest to disclose.

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