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Examining self-affirmation as a tactic for recruiting inactive women into exercise interventions  
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*Published in:*  
Applied Psychology: Health and Well-Being

*DOI:*  
[10.1111/aphw.12303](https://doi.org/10.1111/aphw.12303)

*Publication date:*  
2022

*Document Version*  
Peer reviewed version

[Link to publication in Discovery Research Portal](#)

*Citation for published version (APA):*  
More, K. R., Phillips, L. A., Green, Z., & Mentzou, A. (2022). Examining self-affirmation as a tactic for recruiting inactive women into exercise interventions. *Applied Psychology: Health and Well-Being*, 14(1), 294-310.  
<https://doi.org/10.1111/aphw.12303>

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1 Recruitment of insufficiently active individuals into exercise interventions is difficult due  
2 to many different barriers, including motivational barriers and negative body image. **Objective:**  
3 The present study **provided an initial conceptual test of** whether self-affirmation can help  
4 increase recruitment of insufficiently active women to an exercise intervention. **Design:**  
5 Emerging adult women were randomly assigned to complete a self-affirmation or control task  
6 prior to reading the same message concerning the consequences of inactivity. **Measures:** In  
7 addition to completing demographic and body image measures at baseline, U.S. undergraduate  
8 participants (N = 254) indicated their **interest in registering** for an intervention and their intention  
9 to exercise after the experimental manipulation. **Results:** Data did not support hypotheses that:  
10 (1) **self-affirmed women** would find the message less threatening and less manipulative, (2) **self-**  
11 **affirmed women** would have higher intentions to exercise, (3) **self-affirmed women** would be  
12 more likely to **register interest for a future exercise intervention**, and (4) condition and body  
13 dissatisfaction would interact such that the intervention would be particularly beneficial for  
14 women with high body dissatisfaction. Results revealed that 70% of participants were unwilling  
15 to register for an exercise intervention. **Conclusion:** Results indicate that other novel exercise  
16 intervention recruitment techniques need to be tested.

17 Keywords: Self-affirmation, exercise, intervention, women

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## 24 Examining Self-Affirmation as a Tactic for Recruiting Inactive Women into Exercise

### 25 Interventions

26 Recruiting individuals to health behavior change interventions is notoriously difficult,  
27 with only 55% of randomized control trials meeting their *a priori* recruitment targets (Sully et  
28 al., 2013). Recruitment of inactive individuals to exercise interventions may be especially  
29 difficult as exercise requires a substantial amount of physical exertion and time resources, both  
30 of which are perceived as barriers to engagement (Lovell et al., 2010). This is problematic from a  
31 public health perspective as the benefits of regular exercise on the reduction of risk for chronic  
32 disease development (e.g., Kyu et al., 2016) and for improving the management of pre-existing  
33 chronic conditions (e.g., Colberg et al., 2010) are well-known. Targeting avoidance of exercise  
34 in inactive women is especially valuable as they constitute a high-risk group with higher levels  
35 of physical inactivity in comparison with their male counterparts (World Health Organization,  
36 n.d.). Specifically, research has shown that only 34% of eligible inactive women targeted in an  
37 intervention will be recruited (Korde et al., 2009). Physical inactivity may be exacerbated for  
38 women with high levels of body dissatisfaction – a common phenomenon in women that is a  
39 documented risk factor for physical inactivity (Frederick et al., 2006; More et al., 2019;  
40 Neumark-Sztainer et al., 2006). In light of this, the present research **provides a preliminary**  
41 **conceptual test** of self-affirmation as a novel method for recruiting insufficiently active women –  
42 including especially high-risk women who are dissatisfied with their bodies – to exercise  
43 interventions.

44 Exercise recruitment materials and interventions often include descriptions of the  
45 consequences of inactivity or the benefits of exercise, which is thought to improve recruitment to  
46 randomized clinical trials (Caldwell et al., 2010; Orrow et al., 2012). However, inactive

47 individuals may perceive these messages as threatening, which may result in disengagement with  
48 the recruitment process. Specifically, when an individual encounters information that threatens  
49 the integrity of their self-image, the individual may be more likely to engage in cognitive  
50 defensive strategies, which results in the original threatening message being dismissed (for a  
51 review see Sherman & Cohen, 2006). For example, if individuals receive information linking  
52 physical inactivity to inflammatory and metabolic diseases, they may decide that it does not  
53 apply to them due to their age or that the message content was overblown and manipulative in  
54 nature. This response occurs because people are inherently motivated to protect perceptions of  
55 their self-integrity since threats indicate a failure to meet social and cultural standards of  
56 behaviour (Sherman & Cohen, 2006; Leary & Baumeister, 2000). Unfortunately, this motivation  
57 to protect self-integrity leads to self-defensive behavior, which can be maladaptive as it prevents  
58 individuals from properly perceiving the risks associated with their behavior, which is  
59 detrimental as perception of risk motivates engagement in important health behaviors including  
60 exercise (Renner & Schupp, 2011; Sherman & Cohen, 2006).

61         Self-affirmation is one process that has been used to reduce individuals' defensive  
62 cognitive strategies that lead to dismissal of threatening information. Self-affirmation theory  
63 (Steele, 1988) contends that validating oneself on a personally important value, separate from the  
64 message content, protects self-integrity and prevents perceived social and cultural failure  
65 (Sherman & Cohen, 2006). That is, self-affirmation promotes acceptance of threatening  
66 messages by attesting that one's self-worth is not contingent on the behavior described in such  
67 messages. A meta-analysis of self-affirmation interventions has shown that self-affirmation is  
68 effective for changing not only health-related behavioral intentions, but also actual health  
69 behavior (Epton et al., 2015). Moreover, self-affirmation interventions have been successfully

70 used to expose individuals to the health implications associated with exercise behavior or lack  
71 thereof. Specifically, self-affirmation interventions have been shown to increase acceptance of  
72 threatening information about exercise behavior in comparison with control, especially in  
73 individuals who were classified as insufficiently active (Good et al., 2015). Further, self-  
74 affirmation interventions have been shown to improve attitudes towards exercise as well as  
75 exercise intentions resulting in increased physical activity (Cooke et al., 2014). However,  
76 research has shown that the effects of self-affirmation on physical activity behavior are not long-  
77 lasting. Regarding short-term follow-ups, Strachan and colleagues (2020) found no difference in  
78 intentions or actual physical activity behaviour between control and intervention participants at a  
79 one-week follow-up. Not surprisingly, when considering long-term assessments, one study found  
80 no significant differences between intervention and control groups at a one-year follow-up  
81 (Mancuso et al., 2012). Thus, it is likely that self-affirmation in and of itself is not enough to  
82 result in sustained exercise engagement. **However**, it is possible that self-affirmation  
83 interventions could be an effective means of recruiting these high-risk individuals, such as  
84 inactive women, to more intensive exercise interventions.

85         Self-affirmation interventions have been shown to be especially valuable for individuals  
86 who have low levels of self-esteem (Düring & Jessop, 2015). Specifically, low self-esteem  
87 women and men who received a self-affirmation intervention were more open to acknowledging  
88 the risks associated with physical inactivity and had higher intentions to exercise. It has been  
89 suggested that individuals with low self-esteem may have greater benefits from self-affirmation  
90 interventions as they do not have a wealth of positive self-feelings (Pietersma & Dijkstra, 2012;  
91 Sherman & Cohen, 2006). One specific type of low self-esteem is body dissatisfaction, which is  
92 often referred to as body-esteem or evaluations of one's own body or physical appearance

93 (Mendelson et al, 2001). Individuals with low body-esteem are at an elevated risk of insufficient  
94 levels of physical activity (Kruger et al., 2008; More et al., 2019; Neumark-Sztainer et al., 2006)  
95 and, therefore, may respond especially well to a self-affirmation intervention.

96 The purpose of the present study was to provide a preliminary conceptual test of the  
97 effectiveness of self-affirmation as a pre-intervention for recruiting insufficiently active women  
98 to exercise programs and to evaluate its relative efficacy for different levels of body-esteem. As  
99 highlighted by Strachan and colleagues (2020), the majority of previous exercise-related self-  
100 affirmation studies utilize sub-optimal samples who are not pre-screened based on baseline  
101 physical activity levels. This likely leads to reductions in perceived threat as active individuals  
102 are unlikely to be threatened by exercise-related messages. To this end, in line with the Strachan  
103 et al., (2020) study we recruited individuals who were insufficiently active and disguised the  
104 purpose of our study to avoid recruiting only those with a pre-existing interest in changing their  
105 exercise behaviour. It was hypothesized that (1) women who self-affirm would find an exercise-  
106 promotion message to be less threatening and less manipulative than women who do not self-  
107 affirm (i.e., control group), (2) women who self-affirm would have greater intentions to pursue  
108 exercise in comparison with control, (3) women who self-affirm would be more interested in  
109 participating in a future exercise intervention in comparison to control, and (4) self-affirmation  
110 would be particularly beneficial (for exercise intention and signing up for an exercise  
111 intervention) for those who score high (vs low) on a measure of body dissatisfaction. That is,  
112 body dissatisfaction was hypothesized to moderate the impact of the intervention on outcomes.

## 113 **Method**

### 114 **Participants and Procedure**

115           The sample consisted of 315 women (intervention = 163; control = 152) recruited  
116 through the psychology subject pool from a Midwestern University in the United States.  
117 Participants were recruited if they did not regularly engage in exercise. Eligibility was assessed  
118 using Stage of Change for exercise behavior (Prochaska & DiClemente, 1982). Participants were  
119 eligible to participate if they were in the pre-contemplation (i.e., ‘I currently do not exercise and  
120 I do not intend to start’), contemplation (i.e., ‘I currently do not exercise, but I am thinking about  
121 starting’), or preparation stages (i.e., ‘I currently exercise some, but not regularly (regularly is 3x  
122 per week or more for at least 30 minutes a session)’ of behavior change. That is, participants  
123 were eligible to participate if they did not already regularly engage in exercise, as maintenance of  
124 regular exercise engagement is needed to thwart the consequences of insufficient physical  
125 activity (Kyu et al., 2016). Stage of Change was used in lieu of exercise behavior as a screening  
126 measure as it is less likely to fluctuate due to temporary lapses in exercise engagement.

127           To reduce the likelihood of self-selection bias, the purpose of the intervention was  
128 disguised with participants being told that the study was about ‘personal values’ and ‘memory’.  
129 Participants came to the lab and reported body dissatisfaction, importance of values, and exercise  
130 behavior at baseline, among other variables unrelated to exercise. Following the administration  
131 of the aforementioned measures, participants were randomized to either the control or  
132 intervention (self-affirmation) condition using a random number generator. Participants  
133 completed a standard self-affirmation or control task (Cohen et al., 2000; Epton, 2015;): they  
134 first ranked 11 values from most to least important and were subsequently asked to write about  
135 the personal importance of the value that they rated as most important (self-affirmation  
136 condition) or the importance of their lowest rated value for the average college student (control  
137 condition). Next, participants were told that they would be completing an objective memory test

138 in which they would read scientific facts and try to remember as much of the content as possible.  
139 Participants read a loss-framed message where the risk of physical inactivity was presented to  
140 them (e.g., increased risk of obesity, type-2 diabetes, cardiovascular disease, high blood pressure,  
141 negative mood, depression, cancer), which was created for the purpose of the present study.  
142 Participants were allowed to spend as much time as they desired reading the message.

143 To assess whether participants actually read the message concerning exercise behavior,  
144 they were asked 11 questions assessing their memory of the content presented in the message  
145 (e.g., ‘How many minutes of moderate exercise per week constitutes regular exercise’). The  
146 memory questionnaire was presented immediately after the removal of the exercise message.  
147 Although the survey was delivered online via Qualtrics, the memory questionnaire was  
148 completed using pencil and paper. Memory questionnaires were scored to reflect a score out of  
149 11. During the first semester of data collection, participants were given five dollars if they  
150 correctly answered 80% of the questions. However, compensation for accuracy on the memory  
151 questionnaire created issues such as participants cheating. Thus, we removed the five-dollar  
152 compensation for the second semester of data collection. As such, opportunity to receive  
153 compensation will be tested as a covariate in all analyses. The outcome variables were (1) degree  
154 of fear and defensive processing in response to the exercise-promotion message, (2) degree of  
155 intention for increasing subsequent exercise behavior, and (3) whether participants **registered**  
156 **interest for signing** up for a subsequent exercise intervention or not. Considering the present  
157 study used deception, by concealing the purpose of the study to participants during the  
158 registration phase, participants were fully debriefed on the purpose of the study.

159 A power analysis was conducted *a priori* to decide how many women should be sampled  
160 to be able to detect the difference between independent group means, one-tailed test, with  $\beta = .80$



161 and  $\alpha = .05$ . A recent meta-analysis examining the impact of self-affirmation interventions on  
162 health-related intentions and behavior found a small to medium effect of self-affirmation on each  
163 outcome (Epton et al., 2015). Assuming a small-medium effect ( $d = .32$ ), the aim was to collect  
164 data from 244 participants (122 per group). The data collection termination rule used was to stop  
165 collecting data at the end of the semester in which  $\beta = .80$ ,  $\alpha = .05$  was reached (Simmons et al.,  
166 2011). The hypotheses and data analysis plan were pre-registered on the Open Science  
167 Framework (<https://osf.io/jbsx5/>). Our ethics approval precludes sharing the data publicly due to  
168 privacy reasons. Specifically, in the present study participants reported their email address and  
169 wrote self-affirmation or control statements that may contain personally identifying information.  
170 Deidentified data (i.e., with the removal of email addresses and written statements) can be  
171 requested from the corresponding author.

## 172 **Baseline Measures**

### 173 *Body Dissatisfaction*

174 Due to the dissatisfaction women can have with their overall appearance as well as with  
175 specific components of their appearance (e.g., thinness), a comprehensive approach was utilized  
176 (Frederick et al., 2006). Specifically, both general body dissatisfaction and thinness  
177 dissatisfaction were measured. General body dissatisfaction was measured using the Body Shape  
178 Satisfaction Scale (BSS; Pingitore et al., 1997). The BSS is a 10-item scale that assesses  
179 dissatisfaction with specific body parts (e.g., ‘hips’ or ‘waist’). Participants rated their  
180 dissatisfaction with individual body parts on a five-point Likert-type scale ranging from ‘very  
181 satisfied’ to ‘very dissatisfied’. Higher scores corresponded with higher levels of dissatisfaction  
182 ( $\alpha = .89$ ).

183            Thinness dissatisfaction was measured using the Stunkard Figure Rating Scale (Stunkard  
184 et al., 1983). Participants were shown nine depictions of women ranging from thin to obese.  
185 Participants were first asked to choose the figure that they believed most closely resembled their  
186 own body. Next, participants were asked to choose which figure best resembled the body shape  
187 that they would like to have. Desired body shape was subtracted from actual body shape.  
188 Positive scores were indicative that the participant desired to be thinner, whereas negative scores  
189 were indicative that the participant desired to be larger.

### 190 *Demographics*

191            Age, race, ethnicity, and body mass index (BMI) were assessed via self-report measures.

### 192 *Random Response Check*

193            Two random response checks were embedded within other measures in the baseline  
194 survey. The first item required participants to answer ‘2’ (i.e., ‘If you are reading this, answer 2’)  
195 and the second item required participants to answer ‘agree a little’ (i.e., ‘If you are reading this,  
196 answer agree a little’). Previous research has shown that random responding has been shown to  
197 alter effect sizes (Credé, 2010). In light of this, we took a conservative approach and eliminated  
198 participants who failed either of the random response checks.

### 199 **Experimental Manipulation**

#### 200 *Important Values*

201            The importance of personal characteristics and values were measured using the Sources  
202 of Validation Scale (Harber, 1995). The scale was prefaced with ‘Below is a list of  
203 characteristics and values, some of which may be important to you, some of which may be  
204 unimportant. Please rank these values and qualities in order of their importance to you from 1 to  
205 11 (1 = most important item, 11 = least important item). Use each item only once’. Values and

206 characteristics were: ‘Artistic skills/aesthetic appreciation’, ‘Sense of humor’, ‘Relations with  
207 friends/family’, Spontaneity/living life in the moment’, ‘Musical ability/appreciation’,  
208 ‘Creativity’, ‘Business/managerial skills’, ‘Romantic values’, and ‘Social Skills’. The values  
209 ‘Physical attractiveness’ and ‘Athletic ability’ were removed for the purpose of the present study  
210 because they relate to body image and exercise, respectively. In light of this, these values were  
211 replaced with ‘Kindness, and ‘Academic ability’.

### 212 *Self-affirmation Manipulation*

213 A standard values essay and matched control procedure was used (e.g., Good et al., 2015;  
214 McQueen & Klein, 2006; Sillero-Rejon et al., 2018). Participants in the self-affirmation  
215 condition were asked to write why the value that they rated as most important is of personal  
216 importance to them (e.g., ‘Try to recall a situation where your most important value (e.g.,  
217 Kindness) guided your behavior’). Participants in the control condition were asked to write why  
218 the value that they rated as least important may be important to another college student (e.g.,  
219 ‘Imagine a situation where (e.g., Kindness) may be of importance to the average college  
220 student’). Participants were required to write at least three sentences (*i.e.*, minimum 250  
221 characters). To ensure that participants wrote about the designated value, two researchers  
222 independently coded whether participants wrote about the appropriate value and whether it was  
223 important to the self or an average college student. Participants were removed from all analyses  
224 if they did not follow their respective instructions. This task was chosen because meta-analytic  
225 evidence has shown that self-affirmation interventions have the largest influence on behaviour  
226 when the manipulation is comprised of a values essay (Epton et al., 2015).

### 227 **Follow-up Measures**

#### 228 *Fear and Defensive Processing*

229 A five-point Likert-type scale ranging from ‘strongly disagree’ to ‘strongly agree’ was  
230 used to assess fear and defensive processing. Items were preceded with the stem ‘The  
231 information in the passage I just read...’ Fear was measured using the items: (1) ‘was  
232 threatening’, (2) ‘made me feel anxious’, and (3) ‘made me fearful’ ( $\alpha = .79$ ; Witte, 2010).  
233 Defensive processing was assessed using the items: (1) ‘was not believable’, (2) was  
234 ‘exaggerated’, and (3) ‘tried to manipulate my feelings’ ( $\alpha = .58$ ; van Koningsbrunnen et al.,  
235 2009; Renninger & Dodge, 2019).

### 236 *Interest in Future Exercise Intervention*

237 One item was used to assess whether participants **were interested in signing up** for a  
238 **future** exercise intervention (i.e., ‘Thank you for participating in our study on personal values  
239 and memory. For your effort, we would like to grant you the opportunity to participate in future  
240 research occurring in our lab. Would you like to register for an exercise intervention taking place  
241 in the Healthy Habits Lab?’). Participants who responded ‘yes’ were prompted to provide their  
242 email to allow for future contact.

### 243 *Exercise Intentions*

244 Intentions for increasing subsequent exercise behavior were measured using the Theory  
245 of Planned Behavior Questionnaire (Ajzen, 1991; 2013). Participants read a prompt (i.e.,  
246 ‘Regardless of whether you would like to participate in a future intervention taking place in the  
247 Healthy Habits Lab, do you intend to exercise for at least 30 minutes, five times per week for the  
248 next three weeks?’) and then rated their intentions on a seven-point Likert-type scale ranging  
249 from ‘likely’ to ‘unlikely’. This item corresponds to 150 minutes of activity per week, which is  
250 the amount of moderate activity that is required to reduce the health risks associated with  
251 insufficient activity (Shiroma et al., 2014).

252

## Statistical Analyses

253 Due to the variation in payment availability, opportunity to receive compensation was  
254 tested as a covariate in all analyses. Additionally, participants' memory questionnaire score  
255 served as a screening procedure and all analyses were conducted with and without individuals  
256 who received a score lower than eight out of 11. There were no significant differences between  
257 analyses and, therefore, the results are reported with the inclusion of all participants regardless of  
258 their memory questionnaire score (Steege et al., 2016).

259 Hypotheses 1-3 were tested using a series of one-way ANCOVAs (i.e., exercise intention,  
260 fear, and defensive processing) and a binomial logistic regression (i.e., exercise intervention sign  
261 up). A series of linear (i.e., exercise intention) and binomial logistic regressions (i.e., exercise  
262 intervention sign up) were utilized to test hypothesis 4. Whether payment was offered was  
263 controlled for using a stepwise regression procedure. Group membership (i.e., intervention or  
264 control) and body dissatisfaction (general or thinness) were used as independent variables. The  
265 interactions between group membership and body dissatisfaction (mean centered) were used as  
266 independent variables.

267

## Results

### Preliminary Results

269 Two independent coders assessed compliance to the writing prompt. Compliance was  
270 coded by assessing (1) whether participants in the intervention condition wrote about their most  
271 important value, (2) whether participants in the control condition wrote about their least  
272 important value, (3) whether participants in the intervention group wrote about a time in their  
273 own life, (4) whether participants in the control group only wrote about an average college  
274 student (i.e., did not write about a time in their own lives). Coders agreed on 96% (i.e.,  $n = 302$ )

275 of cases. The remaining 13 cases were resolved with discussion. Participants were eliminated if  
276 they cheated on the memory questionnaire (caught and noted by research assistant;  $n = 5$ ), if they  
277 did not adhere to their assigned writing prompt ( $n = 47$ ), if they failed either of the random  
278 response checks ( $n = 4$ ), or if they did not complete the memory questionnaire ( $n = 5$ ). Thus, the  
279 final sample consisted of 254 women (intervention:  $n = 129$ ; control:  $n = 125$ ). Participants  
280 ranged from 18-28 years of age ( $M = 19.19$ ,  $SD = 1.54$ ) and were of a healthy weight on average  
281 (BMI:  $M = 23.89$ ,  $SD = 4.92$ ). Most participants self-identified as European American (74%).  
282 Other reported ethnicities included Latin American (8.3%), Asian (6.3%), African American  
283 (5.5%), Middle Eastern (5.1%), and Native American (0.8%).

284         Assumptions of linear regression were tested for continuous outcomes (i.e., linearity,  
285 normality of residuals and, homoscedasticity) and were supported. The assumption of  
286 multicollinearity was also supported using both variance inflation factors (VIFs) and  
287 correlations. The interaction term between body image (general and thinness dissatisfaction) and  
288 condition and the body image variable had VIF scores  $>10$ , which can be expected considering  
289 the shared variance between individual predictors and interaction terms. Additionally,  
290 assumption check results did not change when the interaction term was removed to correct for  
291 multicollinearity (Steegen et al., 2016). Linearity for continuous predictors (i.e., general body  
292 dissatisfaction and thinness dissatisfaction) was also assessed for the binomial logistic  
293 regressions using the Box-Tidwell Test (Box & Tidwell, 1962). Linearity was supported for the  
294 relationships between both continuous predictors (i.e., general and thinness body dissatisfaction)  
295 and exercise intervention sign-up. Specifically, the interactions between the continuous predictor  
296 and their natural log did not significantly predict intervention sign-up.

297 Mean imputation was used to correct for missing values in multi-item scales so long as  
298 the majority of items were not missing. Only one participant had missing values present. This  
299 participant was missing all items pertaining to the fear and defensive processing scales *and* the  
300 exercise intention and intervention sign-up items. Thus, no missing values were corrected in the  
301 data. Multivariate outliers were analyzed using Mahalanobis distances ( $p > .001$ ). There were no  
302 multivariate outliers for hypotheses 1-3. Multivariate outliers were not detected for hypothesis 4  
303 concerning general body dissatisfaction when considering exercise intention and intervention  
304 sign-up as outcomes. However, multivariate outliers were detected for hypothesis 4 concerning  
305 payment offered, condition, thinness dissatisfaction, the interaction between thinness  
306 dissatisfaction and condition, and intention ( $n = 3$ )/intervention sign-up ( $n = 1$ ). Results were  
307 analyzed both with and without the inclusion of the multivariate outlier(s) but are reported with  
308 the inclusion of outliers as no differences were found in the aforementioned analyses including  
309 those with the removal of individuals who failed the memory questionnaire (Steege et al.,  
310 2016).

311 The control and intervention group were not different at baseline in terms of Stage of  
312 Change or General Body Dissatisfaction (see Table 1 for descriptive statistics and correlations).  
313 However, the two groups did differ in terms of thinness dissatisfaction, with the intervention  
314 group desiring to be significantly larger than the control group. However, controlling for the  
315 interaction between thinness dissatisfaction and group membership did not influence hypotheses  
316 1-3. Therefore, the analyses are presented without the use of this covariate (Steege et al., 2016).

317 Participants duration of physical activity per week was assessed using the International  
318 Physical Activity Questionnaire and associated scoring procedures (Booth, 2000; International  
319 Physical Activity Questionnaire, n.d.). **Specifically, all daily values that exceeded 3 hours per**

320 day were truncated to 180 minutes total (Moderate  $N = 2$ ; Vigorous  $N = 1$ ). Additionally, all  
321 values less than 10 minutes per average on an exercise day were truncated to 0 (Moderate  $N = 5$ ;  
322 Vigorous  $N = 1$ ) Total Metabolic Equivalent Minutes (i.e., MET minutes) of exercise per week  
323 were calculated where one minute of moderate activity is multiplied by 4 and one minute of  
324 vigorous activity is multiplied by 8. To meet the physical activity guidelines of engaging in 150  
325 minutes of moderate or 75 minutes of vigorous physical activity per week (Shiroma et al., 2014),  
326 an individual would have to engage in 600 MET minutes of activity. A one-sample t-test  
327 revealed that the present sample ( $M_x = 496.23$ ,  $SD = 693.33$ ) engaged in significantly fewer than  
328 600 MET minutes of physical activity per week ( $t(246) = -2.35$ ,  $p = .019$ ). Specifically, on  
329 average the present sample engaged in the equivalent of 124.05 minutes of moderate activity or  
330 62.02 minutes of vigorous activity per week. Average MET minutes per week did not  
331 significantly differ between the intervention and the control group using an independent samples  
332 t-test ( $t(245) = 1.85$ ,  $p = .065$ ). The majority of sample did not engage in at least 600 MET  
333 minutes per week (i.e., 73.7%). Regarding the participants who reported engaging in 600 or more  
334 MET minutes per week, it is important to note that all of these participants reported that they did  
335 not exercise on a regular basis. Thus, the snapshot of weekly exercise provided by the present  
336 survey may not be representative of their typical exercise behaviour. Additionally, retrospective  
337 self-reports on physical activity levels likely provide inaccurate estimates of behaviour. Results  
338 did not vary when participants were constricted to those who engaged in less than 600 MET  
339 minutes over the previous week.

#### 340 **Tests of Hypotheses**

341 The first hypothesis – that women who self-affirmed would find the message less  
342 threatening and less manipulative – was not supported, defensive processing:  $F(1, 250) = 3.81$ ,  $p$



343 = .052; fear:  $F(1, 250) = 0.12, p = .726$ ). The second and third hypotheses, that women who self-  
344 affirmed would have greater intentions to exercise,  $F(1, 250) = .104, p = .308$ , and would be  
345 more likely to **show interest in a future** exercise intervention, ( $X^2(2, n = 253) = .65, p = .724$ ),  
346 were not supported. Whether payment was offered was not significantly related to the outcome  
347 variables in any of the analyses. Exclusion of participants who failed the memory questionnaire  
348 **did not influence the results for hypotheses 1-3. Additionally, exclusion of participants who**  
349 **engage in at least 600 MET minutes over the previous week** did not influence the results for  
350 hypotheses 1-3.

351         The fourth hypothesis, that condition and body dissatisfaction would interact such that  
352 the intervention would be particularly beneficial for women with higher levels of body  
353 dissatisfaction, was not supported. First, group membership, body dissatisfaction (both general  
354 and thinness), and the interaction term did not predict intentions to pursue exercise (see Table 2).  
355 Second, group membership, body image (both general and thinness), and the interaction terms  
356 did not predict intervention **interest** using binary logistic regression analyses. In these analyses,  
357 whether payment was offered was entered in the first block, participant condition and body  
358 image were entered in the second block, and the interaction between the relevant body image  
359 measure and condition was entered in the third block. Specifically, with regards to analyses  
360 including general body image, none of the models improved upon the null model or subsequent  
361 models where applicable: Block 1 ( $X^2(1, n = 253) = .16, p = .691$ ), Block 2 ( $X^2(3, n = 253) = .99,$   
362  $p = .803$ ), and Block 3 ( $X^2(4, n = 253) = 3.21, p = .523$ ). With regards to analyses including  
363 thinness dissatisfaction, none of the models improved upon the null model or subsequent models  
364 where applicable: Block 1 ( $X^2(1, n = 253) = .16, p = .691$ ), Block 2 ( $X^2(3, n = 253) = 2.15, p =$   
365  $.542$ ), and Block 3 ( $X^2(4, n = 253) = 3.88, p = .423$ ). The entirety of these results did not vary

366 with the exclusion of participants who failed the memory questionnaire, with the removal of  
367 multivariate outliers, **or with the removal of participants who engaged in at least 600 MET**  
368 **minutes over the previous week .**

## 369 **Discussion**

370 Physically inactive individuals are at an increased risk of developing life-threatening  
371 health conditions (Kyu et al., 2016). Unfortunately, this information may be difficult to  
372 effectively communicate in health intervention settings as people have a well-known tendency to  
373 dismiss information that threatens their integrity and self-worth (Sherman & Cohen, 2006). Self-  
374 affirmation interventions have been shown to lead to increased acceptance of information that is  
375 perceived as threatening, including information that pertains to exercise (Good et al., 2015). This  
376 is especially important given that perception of health-risk is likely needed to motivate behavior  
377 change (Renner & Schupp, 2011; Sherman & Cohen, 2006). In light of this, self-affirmation as a  
378 pre-intervention designed to recruit insufficiently active women to exercise interventions was  
379 **conceptually** tested. Of specific interest was whether self-affirmation would be an especially  
380 valuable technique to recruit individuals who feel dissatisfied with their bodies (i.e., low body-  
381 esteem) as they are high risk in terms of actively avoiding exercise, and self-affirmation  
382 interventions have been found to be particularly valuable for individuals with low self-esteem  
383 (Mendelson et al., 2001; More et al., 2019).

384 The results of **this initial conceptual test of self-affirmation as a pre-intervention**  
385 **recruitment technique** suggest that self-affirmation is *not* an effective means of recruiting  
386 insufficiently active women to exercise interventions. Specifically, there were no significant  
387 differences between the intervention group and the control group in terms of fear and defensive  
388 processing. Additionally, there were no significant differences between groups in terms of

389 intention to pursue exercise, **interest in registering for a future exercise intervention**, and there  
390 was no special benefit of the intervention for women who reported being dissatisfied with their  
391 bodies (i.e., low body-esteem). Interestingly, approximately 70% of individuals in each group  
392 were **not interested in registering for a future exercise intervention** despite being classified as  
393 insufficiently active and having recently learned or been reminded about the specific  
394 consequences of said inactivity. Thus, it is clear that researchers and interventionists must  
395 explore other recruitment techniques that aim to increase participant registration in exercise-  
396 related interventions. This exploration should include empirical research on the boundary  
397 conditions of self-affirmation interventions for improving health-related intentions and  
398 behaviors.

399         Although these results help shed light on how the vast majority of insufficiently active  
400 women **are not interested in engaging with** exercise-related interventions, there are limitations  
401 that must be addressed. First, only data from relatively young and healthy college women was  
402 collected and, therefore, the results may not generalize to other populations, such as young adults  
403 who do not attend college, adults in other age groups, or men (Peterson, 2001). However,  
404 examining effective ways to recruit insufficiently active college women to exercise interventions  
405 is still important, considering that college women report low levels of physical activity, are not  
406 meeting guidelines for physical activity engagement (Huang et al., 2003), and suffer from  
407 particularly low levels of body-esteem (Sheldon, 2010). Second, although self-affirmation has  
408 been shown to be effective across ethnicities, past meta-analyses have shown that it is not as  
409 effective for white individuals, which the present sample was largely composed of (Epton et al.,  
410 2015). Third, previous research conducted using college students has had the control groups  
411 think about their least important value in terms of someone else (e.g., Cohen et al., 2000; Good et

412 al., 2015). It is possible that this manipulation is flawed as it may inherently lead to self-other  
413 comparisons and, in turn, a self-enhancement effect (e.g., see Suls et al., 2002). Although any  
414 control participants who clearly self-affirmed were removed, it is possible that control  
415 participants were inadvertently self-affirming by comparing themselves to the average college  
416 student. Fourth, it should be noted that the exercise intention item may have been perceived as  
417 too challenging for some participants, despite participants in all both groups scoring above the  
418 scale median. However, we framed our intention item around national guidelines as this is what  
419 is known to lead to substantial health benefits (Shiroma et al., 2014). Fifth, although participants  
420 in both groups scored above the scale median on fear processing, it is possible that the messages  
421 were not threatening enough. People encounter health-related messages regularly (e.g., at the  
422 doctor's office, on social media, on busses) which may have reduced the perceived severity of  
423 the message content. Future research will be needed to assess how message framing (e.g., loss vs  
424 gain-framed or health vs appearance-framed) influences defensive processing of health-related  
425 messages. A sixth limitation worth noting is that participants may have been more willing to  
426 participate in the offered exercise intervention if immediate support had been offered rather than  
427 offering support for behavior change in the future (Ferrer & Cohen, 2018). It is possible that  
428 participants were **disinterested in engaging with a future** intervention due to perceived barriers to  
429 exercise engagement such as **an** unspecified time commitment and **an** unspecified intensity of  
430 exercise. Additionally, although the present sample had free access to gym facilities and fitness  
431 classes on campus, they may have perceived other barriers, such as low levels of social support  
432 (Grubbs & Carter, 2002). However, it should be noted that the present study assessed interest in  
433 a future intervention and to that end it can be inferred that participants would receive more  
434 details prior to actually committing to registration. It is also not possible to determine whether

435 participants were disinterested in participating in an exercise intervention or another study in  
436 general. To this end, future research should offer an immediate intervention that includes more  
437 specific details regarding time commitment and exercise intensity expected to determine the  
438 robustness of the results presented here. Finally, although feelings of success and failure as  
439 brought on by the manipulation were not directly assessed, it should be noted that the  
440 intervention manipulation was checked by assessing adherence to the writing prompt such that  
441 only the intervention group wrote about a time in their own lives related to their most important  
442 value. Additionally, it is important to note that direct manipulation checks in self-affirmation  
443 research have been shown to dampen intervention effects by causing the control group to engage  
444 in self-affirmation strategies (e.g., McQueen & Klein, 2006).

445         The limitations may have resulted in the null effect of the self-affirmation intervention.  
446 However, it is also possible that the following more substantive processes could be at play.  
447 Previous research examining the impact of self-affirmation interventions on promoting intentions  
448 to exercise and actual behavioural shifts are mixed. Although some previous research has shown  
449 that self-affirmation can positively shift exercise-related attitudes, intentions, and behaviour  
450 (Cooke et al., 2014; Good et al., 2015), our research findings have aligned with studies which  
451 have shown no such effects (Strachan et al., 2020). The meta-analytic evidence that shows self-  
452 affirmation influences health-related behaviour and intentions (Epton et al., 2015; Sweeney &  
453 Moyer, 2014) may be especially or only the case for simple-to-perform health behaviours (e.g.,  
454 such as vaccine uptake) in comparison with difficult to perform health behaviours (e.g., changes  
455 in diet or exercise). To be maintained, complex behaviours need to be regulated through  
456 processes that are more complex than initial engagement such as through motivation change,  
457 habit formation, or identity development (Rhodes, 2017). To that end, even if self-affirmation

458 was sufficient to change initial behavioural engagement, it would not be sufficient to instill  
459 maintenance (Mancuso et al., 2012; Strachan et al., 2020). The influence of self-affirmation  
460 interventions on simple vs. complex health-behaviours has yet to be assessed in meta-analytic  
461 moderation analyses. The present study did not assess actual behaviour change, however, the act  
462 of registering **interest for a future exercise** intervention implies that behaviour change would be  
463 expected in the future and so could have influenced the effectiveness of the intervention.

464         Despite the aforementioned limitations, it is nonetheless interesting that the majority of  
465 insufficiently active women were uninterested in registering for an exercise intervention even  
466 after learning about, or being reminded of, the consequences of remaining insufficiently active.  
467 Although participants in both groups reported moderate intentions to regularly engage in future  
468 exercise, it is known that the majority of intentions are not translated into behavior (Sheeran &  
469 Webb, 2016). Thus, future research is needed to determine how researchers and interventionists  
470 can effectively recruit insufficiently active individuals to exercise interventions. This research is  
471 likely to be especially important when considering groups who are predisposed to inflammatory  
472 and metabolic disease. Future research should explore the boundary conditions of self-  
473 affirmation, such as type of control condition, and whether the support offered is immediate, or  
474 in the case of the present study, delayed (Ferrer & Cohen, 2018). Additionally, promoting self-  
475 compassion in insufficiently active individuals may be an especially viable option to promote  
476 intervention recruitment (Homan & Sirois, 2017). Although this process is more time consuming  
477 than self-affirmation, self-compassion predicts better physical health because of health behavior  
478 engagement, such as exercise (Homan & Sirois, 2017; Magnus et al., 2010). Concerning  
479 individuals who are dissatisfied with their bodies, body-functionality interventions may be an  
480 especially valuable pre-intervention technique (Alleva et al., 2018). That is, due to the tendency

481 for dissatisfied individuals to avoid exercise, improving body image may be an important first  
482 step to promoting exercise engagement (More et al., 2019; Neumark-Sztainer et al., 2006).

### 483 **Conclusion**

484 This research **provided an initial conceptual test of** self-affirmation as a pre-exercise  
485 intervention recruitment technique for insufficiently active women. Although self-affirmation  
486 was not effective in terms of **eliciting interest for a future intervention**, evidence is provided that  
487 novel means of recruiting insufficiently active women to interventions is necessary. Specifically,  
488 it was found that approximately 70% of participants were **not interested in registering** for an  
489 exercise intervention even though they had recently learned about, or had been reminded of, the  
490 consequences of their physical inactivity. In light of this, two methods that may increase  
491 registration in exercise interventions were proposed.

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Table 1  
*Frequencies and Means (SD) for Dependent Variables by Experimental Condition with Correlations (N = 254)*

Variable	Control	Intervention	<i>p</i>	Correlations					
Baseline				1	2	3	4	5	6
1. Stage of Change	-	-	.879						
Pre-Contemplation	6	7	-						
Contemplation	62	60	-						
Preparation	57	62	-						
2. General Body Dissatisfaction	3.03 (0.82)	2.83 (0.79)	.053						
3. Thinness Dissatisfaction	1.06 (1.09)	-3.05 (1.26)	< .001		.46 [.50]				
Follow-up									
4. Intentions	3.79 (2.15)	3.54 (1.80)	-		-.13 [-.08]	.001 [.02]			
5. Intervention Sign-Up	-	-	-		-	-			
Yes	40	36	-		-	-			
No	85	92	-		-	-			
6. Fear Processing	2.53 (1.00)	2.58 (1.09)	-		.10 [.06]	.06 [.09]	-.03 [-.10]		
7. Defensive Processing	2.03 (0.86)	2.24 (0.92)	-		-.07 [-.03]	-.11 [-.03]	.04 [.02]	-	.26 [.27]

*Note:* For baseline, stage of change was assessed using chi-square analysis. General body dissatisfaction and thinness dissatisfaction assessed using independent t-tests. Correlations for the control group appear in brackets.



Table 2  
*Regression Analysis Results for Hypothesis 4: Intention to Exercise*

Variable	<i>B</i>	SE	$\beta$	<i>t</i>	<i>p</i>
General Dissatisfaction					
Model 1					
Payment	-.02	.25	-.01	-.06	.950
Model 2					
Payment	-.02	.25	-.01	-.07	.943
Condition	.30	.25	.08	1.21	.228
Body Dissatisfaction	-.26	.16	-.11	-1.65	.100
Model 3					
Payment	-.02	.25	-.01	-.06	.951
Condition	.30	.25	.08	1.21	.229
Body Dissatisfaction	-.37	.50	-.15	-.74	.462
Interaction	.07	.31	.05	.23	.817
Thinness Dissatisfaction					
Model 1					
Payment	-.02	.25	-.01	-.06	.950
Model 2					
Payment	-.03	.25	-.01	-.13	.894
Condition	.18	.51	.05	.348	.728
Body Dissatisfaction	.02	.11	.02	.17	.866
Model 3					
Payment	-.03	.25	-.01	-.13	.893
Condition	.17	.52	.04	.33	.744
Body Dissatisfaction	-.03	.33	-.04	-.10	.923
Interaction	.04	.22	.06	.16	.872