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Goal Prioritization and Behavior Change:

Evaluation of an Intervention for Multiple Health Behaviors

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Abstract

Objectives: Goal prioritization is a promising strategy for promoting health behavior change. The present research (a) tested whether goal prioritization engenders change in multiple health behaviors, (b) compared the effectiveness of prioritizing one versus two health behavior goals, and (c) assessed whether prioritization compromises the performance of non-prioritized behaviors. **Methods**: Participants (N = 1,802) were randomly allocated to one of two intervention conditions (prioritize one versus two behaviors) or two no-prioritization, control conditions. Participants in the intervention conditions self-selected the behavior(s) to prioritize from a given set. Goal priority and behavioral performance were assessed 8 weeks later. **Results**: The prioritization interventions were successful in promoting goal priority and led to significantly greater behavior change compared to both control conditions. Prioritizing two health behavior goals led to increased behavioral performance compared to prioritizing a single goal. Goal prioritization did not lead to a decline in rates of performance of non-prioritized behaviors. **Conclusions**: The present findings offer new evidence that goal prioritization is effective in promoting health behavior change. Prioritizing health goals engenders behavior change for both one and two focal behaviors and does so without adversely affecting the performance of non-prioritized health behaviors. Further tests of interventions to promote the priority of health goals are warranted.

Key words: goal prioritization; goal intention; health behavior.

Goal Prioritization and Behavior Change:
Evaluation of an Intervention to Promote Multiple Health Behaviors

Health goals are pursued during the same time periods and using the same resources as the myriad of other goals for which a person strives (Abraham & Sheeran, 2003; Austin & Vancouver, 1996; Lowe, Norman, & Sheeran, 2017). However, most health behavior theories (e.g., Conner & Norman, 2015) focus on the determinants of single behavioral goals (e.g., increased physical activity or reduced alcohol consumption) and neglect how people navigate the reality of multiple, varied goals (Lowe et al., 2017). *Goal prioritization* is a key concept for understanding the pursuit of multiple goals and refers to the temporary increase in the importance attached to, and resources directed towards, one or more goals compared to other goals – that serve to benefit the performance of the prioritized behavior (Unsworth, Yeo, & Beck, 2014). Despite its conceptual significance, goal prioritization has attracted relatively little empirical attention (Conner et al., 2016; Geers, Wellman, & Lassiter, 2009). Accordingly, the present study tested an intervention designed to promote goal prioritization on health behavior change. The research focused on whether goal prioritization can promote the performance of one and two health behavior goals, and whether prioritization results in reduced performance of non-prioritized health behaviors.

Goal Prioritization

According to Unsworth et al. (2014), priority is accorded to goals that have high informational value (e.g., the focal goal facilitates other higher- and lower-order goals), high affective value (i.e., attainment of the goal engenders positive affect), and high expectancy (i.e., allocation of resources to the goal is feasible). Goal prioritization should promote the performance of goal-directed behaviors via several mechanisms to do with increased goal

importance. First, prioritization increases goal activation (Unsworth et al., 2014); this heightened accessibility is, in turn, associated with improved translation of goals into action (e.g., Cooke & Sheeran, 2004). Second, prioritization means that goals are scheduled to be enacted more proximally which increases the likelihood of performance, especially in the case of deadlines or small windows of opportunity (Gollwitzer & Sheeran, 2006). Third, prioritization leads to greater commitment of time and energy to goal pursuit (Austin & Vancouver, 1996; Conner et al., 2016). Fourth, prioritization leads to improved shielding of the focal goal and inhibition of non-prioritized goals (Unsworth et al., 2014). Thus, there are good conceptual grounds for predicting that prioritizing health behavior goals increases behavioral performance.

To date, only two papers have reported tests of the impact of goal prioritization on rates of performance of health behaviors (Conner et al., 2016; Geers et al., 2009). Goal priority predicted health behaviors in three observational studies (Conner et al., 2016, Studies 1 and 4; Geers et al., 2009), and two experiments showed that goal prioritization increased exercise behavior (Conner et al., 2016, Studies 2 and 3). Although these experimental tests indicated that promoting goal prioritization holds promise for behavior change, the use of small, convenience samples and short-term follow-ups (2 weeks) suggests that the case is not yet made that goal prioritization promotes health behavior change and that additional tests would be desirable. The first goal of the present research, therefore, is to test the impact of goal prioritization for a greater range of health behaviors, among a larger sample, and over a longer time compared to previous research.

Previous interventions to promote goal prioritization also leave two further questions unanswered. First, prioritization interventions have thus far always involved a single goal, even though good physical health relies upon the performance of a suite of health behaviors (e.g.,

physical activity, healthy eating, low alcohol consumption, reduced sedentariness; Adams et al., 2019). It is yet unclear whether prioritizing two health behavior goals leads to an improvement in performance for both behaviors that is similar to the improvement observed for prioritizing a single goal. Second, the potential for adverse consequences of goal prioritization has not been examined in prior studies. Although goal prioritization engendered change in the focal behavior (e.g., Conner et al., 2019), it remains to be determined whether this benefit in performance came at a cost to the performance of health behaviors that were not prioritized – did participants perform the prioritized behavior more often but undertake non-prioritized behaviors less often compared to the no-prioritization, control condition?

Theoretical Perspectives on Prioritizing One Versus Two Behaviors

Different theoretical perspectives offer competing predictions about the impact of prioritizing one vs. two behaviors and the impact of prioritization on the performance of non-focal behaviors. According to the Strength Model of Self-Control (SMSC; e.g., Baumeister, Vohs, & Tice, 2007), engaging in multiple behaviors draws upon the same limited resource; performing many different behaviors draws more heavily on this resource and is thus liable to lead to a temporary reduction in people's capacity for self-regulation (termed *ego-depletion*). The SMSC implies that prioritizing two health behaviors is unlikely to benefit – and might even harm – performance relative to prioritizing a single behavior, and that prioritization of one or two behaviors should negatively affect the performance of behaviors that were not prioritized. Resource limitations mean that prioritization is liable to have costs for rates of performance of other behaviors.

A more recent, alternative theory construes self-control as value-based choice (VBC; Berkman, 2018; Berkman et al., 2017). According to this perspective, the subjective value of a behavior is computed relative to the value of other behaviors in the choice set and this determines

the amount of effort that is devoted to behavioral engagement. Ego-depletion is thus less about the lack of some resource but is rather a function of the strategic allocation of effort to tasks that are deemed more versus less important (Inzlicht & Berkman, 2015). As prioritizing a goal exemplifies a high-value choice (Berkman et al., 2017), the VBC perspective implies that prioritizing two behavioral goals should engender superior performance compared to prioritizing one goal, and that prioritization should not necessarily lead to poorer performance of non-prioritized behaviors.

The Present Study

Based on the foregoing review of literature, we conducted a field experiment on goal prioritization and health behavior change. The experiment involved two intervention (prioritization) conditions and two control conditions. The intervention conditions involved a mono-priority condition (participants prioritize one behavioral health goal) vs. a dual-priority condition (participants prioritize two behavioral goals). Participants in the two control conditions did not prioritize any health goal. The relevant-behavior control condition involved completing the same questionnaire as participants in the two intervention conditions; the irrelevant-behavior control condition involved completing a survey about consumer behaviors that were unrelated to health. These two control conditions serve to isolate the potential impact of merely completing a survey about the health behaviors on subsequent behavioral performance (see Wilding et al., 2016, for a review).

The experiment had three aims: (1) Offer a new and more rigorous test of the impact of goal prioritization on multiple behavior change; (2) Test whether prioritizing two health behavioral goals leads to improved performance of both behaviors compared to prioritizing a single behavioral goal; and (3) Assess the impact of prioritization on rates of performance of non-prioritized health

behaviors. Findings for aims 2 and 3 will offer the first empirical test of two theoretical perspectives on goal prioritization (SMSC vs. VBC) in a field setting.

Method

Sample and Procedure

Participants aged 18-65 years were recruited via Prolific (an online recruitment platform) during October to December 2017. Figure 1 shows the participant flow diagram and study design. Of the 1,843 participants who started the experiment, 1,828 were assessed for eligibility and 1,802 were randomized to condition, while 1,441 started both the baseline and follow-up (8 weeks later) questionnaires and could be matched across time points (888 females, 543 males, 10 gender information missing; Age: $M = 35.05$, $SD = 10.94$). Participants were paid £3.82 (approximately $5.36) for completing both parts of the study. The main analyses focused on the 1,428 with complete data on all measures at both time points (Figure 1). The study received ethical approval from the School of Psychology Ethics Committee, University of Leeds, UK (psyc-17-0149).

Design and Procedure

Participants were automatically randomized to one of four conditions when they clicked on the study link. Participants were blinded to condition, although analyses were conducted unblinded. The four conditions were structured by one over-arching factor (control vs. goal prioritization intervention) with two nested factors (one within control and one within intervention). In the two nested control conditions, participants completed baseline questions about six consumer behaviors (Irrelevant-behavior Control: purchasing groceries, purchasing toiletries and/or cosmetics, purchasing household cleaning items, reducing clothing purchasing, reducing music purchasing including digital downloads, and reducing spending) *or* about six

health behaviors (Relevant-behavior Control: taking the recommended levels of physical activity each week; consuming at least five portions of fruit and vegetables per day; flossing teeth at least twice per day; avoiding eating unhealthy snacks each day; avoiding drinking more than the recommended daily limits of alcohol; avoiding continuous sitting for over 30 minutes at a time; recommended levels for each behaviors were included). Participants in both intervention conditions completed questions about the same six health behaviors.

The goal prioritization intervention was inspired by Unsworth et al.'s (2014) analysis of the role of information and affective value and expectancy. The intervention was presented immediately after the health behavior measures and invited participants to select either one (Mono-priority Intervention) or two (Dual-priority Intervention) of the six health behaviors to prioritize over the next two months. Participants then had to write down two sentences (for each behavior selected) that specified how they would prioritize the behavior(s).

Measures

At baseline, participants in all conditions completed demographic questions assessing age, gender, ethnicity (coded non-White or White), education (coded Below degree or Degree and above), and employment (coded Employed, Not employed, or Student). Nationality, income, and ladder measures of socioeconomic status (Adler et al. 2000) plus various behavior-specific measures (e.g., attitude; social norms; self-efficacy) were also assessed but not analyzed here. The baseline and follow-up questionnaires, the intervention materials, and the dataset can each be obtained from the first author (see Table S1 in the Supplemental Materials for a summary of measures).

The following measures of the six health behaviors were taken in the Relevant-behavior Control, Mono-priority Intervention, and Dual-priority Intervention conditions at baseline: *Goal*

intention was assessed as the mean of two items (e.g., 'I intend to [e.g., take the recommended level of physical activity each week] over the next two months, strongly disagree-strongly agree', scored 1-5, *rs* = .80 to .88 across behaviors). *Goal prioritization* was assessed by a single item ('I would prioritize [e.g., taking the recommended level of physical activity each week] over other goals important to me over the next two months, strongly disagree-strongly agree', scored 1-5). In a pilot study ($N = 997$), this single item measure was shown to be strongly correlated ($r = .75$, $p < .001$) with a reliable 4-item measure of goal prioritization (= .87). *Past behavior* was assessed by a single item (e.g., 'I engage in [e.g., the recommended level of physical activity each week], *never-frequently*', scored 1-5). The same behavior-specific measures were taken in relation to each of six consumer behaviors in the Irrelevant-behavior Control condition but were not further analyzed.

Goal priority and behavior measures were obtained for the six health behaviors in all four conditions at follow-up. *Goal priority* was assessed by the equivalent item to that used at baseline (e.g., 'Over the last two months I prioritized [e.g., taking the recommended level of physical activity each week] over other goals important to me, strongly disagree-strongly agree', scored 1-5). *Behavior* was assessed by three or four items for each behavior. Physical activity was assessed by four items ("On average over the past two months, how many minutes of moderate physical activity did you do each week? ___ minutes"; "On average over the past two months, how many minutes of vigorous physical activity did you do each week? ___ minutes"; "How frequently did you take the recommended levels of physical activity each week over the last two months?, Never, rarely, sometimes, often, always"; "Over the last two months, I took the recommended levels of physical activity each week, strongly disagree, 1 to strongly agree, 5"). For the remaining five health behaviors three items were used (e.g., "On average over the past

two months how many portions of fruit and vegetables did you eat on average each week? ___ portions"; "How frequently did you eat at least five portions of fruit or vegetables a day over the past two months? never, rarely, sometimes, often, always"; "Over the past two months I ate at least 5 portions of fruit and vegetables per day, strongly disagree, 1 to strongly agree, 5"). Large values for each open-ended measure were truncated (to 700 minutes/week for the physical activity questions, to 70 portions/week for fruit and vegetables, and to 7 days/week for other behaviors), although removing these data did not substantively alter the findings. Measures of minutes of physical activity were combined into METs (4 x moderate + 8 x vigorous minutes). The three measures were each standardized and then averaged for each behavior (αs = .83 to .96).

Analyses

Analyses were conducted using SPSS24 and HLM7 in six blocks to (a) undertake randomization and representativeness checks, (b) examine the factors that influence the choice of goals to prioritize, (c) assess intervention effects on goal priority, (d) test intervention effects on behavior, (e) assess if prioritizing two compared to one health behaviors produces more behavior change, and (e) test if prioritization comes at a cost in performance for the non-prioritized behaviors (see Table 1 for a summary of the analytic approach). The first block of analyses used Chi-squared and one-way ANOVA to test for differences on demographic variables between the four conditions to assess the success of randomization. Chi-squared and one-way ANOVA were conducted to test for differences between those who only completed the baseline questionnaire compared to those who completed both baseline and follow-up questionnaires. Chi-squared was also used to test for differences in drop-out rates between the four conditions. Across the retained sample, randomization checks used multi-level modeling to test for differences between

conditions (i.e., Relevant-behavior Control, Mono-priority Intervention, Dual-priority Intervention) on baseline variables (goal priority, goal intention, past behavior). This analysis tested for an overarching intervention effect (Relevant-behavior Control condition scored 0 vs. Mono-priority Intervention and Dual-priority Intervention conditions both scored 1) or a nested effect testing differences between the two intervention conditions (Mono-priority Intervention scored 0 vs. Dual-priority Intervention scored 1) on baseline variables.

The second block of analyses compared the frequency with which each of the six health behaviors were selected for goal prioritization in each of the two intervention conditions. To assess the comparability of the prioritized and non-prioritized behaviors, multi-level modeling tested for differences in baseline goal intentions and past behavior between prioritized (scored 1) and non-prioritized (score 0) health behaviors selected by those in the intervention conditions.

The third block of analyses tested for differences in goal priority at follow-up between all four conditions using multi-level regressions. This analysis tested for an overarching intervention effect (both control conditions scored 0 vs. both intervention conditions scored 1) or as two nested effects testing differences between the control conditions (Irrelevant-behavior Control scored 0 vs. Relevant-behavior Control scored 1) and between the two intervention conditions (Mono-priority Intervention scored 0 vs. Dual-priority Intervention scored 1). In addition, in the two intervention conditions, multi-level regressions were used to examine differences in goal priority between those behaviors selected to be prioritized (scored 1) and those not selected to be prioritized (scored 0).

The fourth block of analyses involved a series of tests on follow-up behavior. First, we compared behavior at follow-up by condition using multi-level regressions and tested for an overarching intervention effect (both Control conditions scored 0 vs. both Intervention

conditions scored 1) and the nested effect within the control condition. Second, we undertook more focused analyses that offered a strong test of goal prioritization using data from the three conditions at baseline that had measures of health goal intentions and past behavior (i.e., Relevant-behavior Control, Mono-priority Intervention, Dual-priority Intervention). We tested the overarching intervention effect (Relevant-behavior Control scored 0 vs. Mono-priority Intervention and Dual-priority Intervention scored 1) controlling for baseline goal intentions and past behaviors.

The fifth block of analyses also involved a series of tests on follow-up behavior using multi-level regressions. First, we compared behavior at follow-up between the two intervention conditions (i.e., Mono-priority Intervention, Dual-priority Intervention). Second, within the Dual-priority Intervention we tested for differences between the first and second prioritized behaviors and between different combinations of two prioritized behaviors.

The sixth and final block of analyses involved a test on baseline and follow-up behaviors controlling for baseline goal intentions in the intervention conditions. We tested for an interaction between whether a behavior was prioritized or not and time (baseline versus follow-up). For this analysis we converted our measure of past behavior into z-scores to help with interpreting the change in behavior between baseline and follow-up. In multi-level modeling this was instantiated as a cross-level interaction between a time effect (baseline = 0, follow-up = 1; level 1) and prioritization (non-prioritized behavior = 0, vs. prioritized behavior = 1; level 2). Where the cross-level interaction was significant, simple slopes analyses were used to examine the effects for time (baseline versus follow-up) in prioritized versus non-prioritized behaviors. Mean levels of behavior change (baseline to follow-up) for non-prioritized and prioritized behaviors are reported to aid interpretation.

Multi-level regressions were conducted using Hierarchical Linear Modeling using HLM7 (Raudenbush & Bryk, 2002). To allow variation across individuals we used random effects. For analyses in blocks 1 to 5 we treated the data as having a 2-level hierarchical structure, Level 1 being the within-person variation across behaviors and Level 2 the between-person variability. Level 1 predictor variables were centered around the group mean. For the block 6 analyses focusing on change in behavior in prioritized versus non-prioritized behaviors we treated the data as having a 3-level hierarchical structure, Level 1 being the within behavior variation across time (baseline versus follow-up), Level 2 being the within-person variation across behaviors, and Level 3 the between-person variability. Level 1 and Level 2 predictor variables were centered around the group mean. For each model, from the population average model with robust standard errors we report unstandardized coefficients, standard errors, and standardized coefficients (Hox, 2002). In the block 6 analyses, any significant cross-level interaction was decomposed using the free software provided by Preacher (Model 3; http://www.quantpsy.org/interact/hlm2.htm).

Results

Randomization and Representativeness Checks

Table 1 provides a summary of the results for each block of analyses. The first block of analyses showed that randomization to condition was successful. The four conditions did not differ in relation to any demographic variable: age $F(3,1791) = 0.74$, $p = .528$; gender $\chi^2(3) = 1.74$, $p = .629$; ethnicity $\chi^2(3) = 4.53$, $p = .210$; education $\chi^2(3) = 2.24$, $p = .524$; employment $\chi^2(6) = 6.81$, $p = .339$. Representativeness checks indicated two significant differences between participants who completed the baseline questionnaire only as compared to participants who fully completed both questionnaires. Participants who completed both questionnaires were more

likely to be older, $F(1,1793) = 27.64$, $p < .001$, and were more likely to have completed higher education, $\chi^2(1, N = 1796) = 9.96$, $p = .002$. There were no differences for gender, $\chi^2(1, N = 1790) = 2.96$, $p = .090$, ethnicity, $\chi^2(1, N = 1797) = 0.73$, $p = .387$, or employment status, $\chi^2(2, N = 1802) = 5.87$, $p = .053$. Between 76.7% (mono-priority intervention) and 80.6% (dual priority intervention) of participants allocated to condition were analyzed (Figure 1). There was no evidence of differential drop-out across the four conditions, $\chi^2(3) = 4.30$, $p = .231$. Further supporting the success of randomization, multi-level model comparisons of those in the Mono-priority Intervention or Dual-priority Intervention versus Relevant-behavior Control conditions (goal priority: $B = 0.037$, $SE = 0.051$, $\beta = .014$, $p = .466$; goal intention: $B = 0.030$, $SE = 0.043$, $\beta = .010$, $p = .491$; past behavior: $B = -0.013$, $SE = 0.038$, $\beta = -.005$, $p = .737$), and Mono-priority Intervention versus Dual Priority Intervention conditions (goal priority: $B = -0.052$, $SE = 0.060$, $\beta = -.019$, $p = .382$; goal intention: $B = 0.041$, $SE = 0.050$, $\beta = .014$, $p = .408$; past behavior: $B = 0.012$, $SE = 0.044$, $\beta = .004$, $p = .778$) indicated no significant differences in baseline scores on these variables.

Behaviors Selected for Goal Prioritization

The second block of analyses showed that within the two prioritization conditions (i.e., Mono-priority Intervention and Dual-priority Intervention), each of the six health behaviors was prioritized by at least some participants. However, three behaviors were more likely to be prioritized (taking the recommended levels of physical activity each week: $n = 294$ first priority, $n = 86$ second priority; consuming at least five portions of fruit and vegetables per day: $n = 168$ first priority, $n = 100$ second priority; avoiding eating unhealthy snacks each day: $n = 176$ first priority, $n = 116$ second priority) and three less likely to be selected (flossing teeth at least twice per day: $n = 86$ first priority, $n = 58$ second priority; avoiding drinking more than the

recommended daily limits of alcohol: n = 75 first priority, n = 36 second priority; avoiding continuous sitting for over 30 minutes at a time: n = 95 first priority, n = 77 second priority) for prioritization. Multi-level modeling of the data from the two intervention conditions also indicated that while baseline goal intentions were significantly higher for prioritized compared to non-prioritized behaviors (B = 0.154, SE = 0.043, β = .053, p < .001), past behavior was not (B = -0.008, SE = 0.040, β = -.004, p = .844). This indicates that participants were more likely to prioritize health behaviors for which they had stronger goal intentions but not behaviors they more frequently performed.

Intervention Effects on Goal Priority

In the third block of analyses, multi-level regression indicated that goal priority at follow-up was higher in the intervention compared to the control conditions (B = 0.135, SE = 0.043, β = .050, p = .002); there were no differences between Irrelevant-behavior Control versus Relevant-behavior Control conditions (B = 0.022, SE = 0.058, β = .034, p = .704), or between Mono-priority Intervention versus Dual-priority Intervention conditions (B = 0.001, SE = 0.064, β = .0004, p = .982). Multi-level modeling of the data from the two intervention conditions indicated that T2 goal priority was higher for prioritized compared to non-prioritized behaviors controlling for baseline goal intentions and past behavior (B = 0.111, SE = 0.039, β = .035, p = .006). These findings indicate that our intervention was effective in generating increased goal priority over an 8-week period.

Impact of Goal Prioritization on Behavior Change

In the fourth block of analyses, multi-level regression analyses indicated that behavior at follow-up was greater in the intervention conditions compared to the control conditions (B = 0.062, SE = 0.026, p = .017), and there was no difference in the rates of behavioral performance

between the Relevant-behavior and Irrelevant-behavior Control conditions (B = -0.028, SE = 0.035, p = .430). These findings indicate that goal prioritization engendered greater health behavior change compared to both control conditions.

We also tested whether prioritization is effective even after goal intentions and past behavior have been taken into account, using data from the three conditions (Relevant-behavior Control, Mono-priority Intervention, Dual-priority Intervention) in which the covariates were assessed. Unsurprisingly, goal intentions and past behavior were significant covariates in all analyses (all Bs > 0.132, ps < .001). Notwithstanding the strong associations observed for the covariates, there was a significant effect for the overarching intervention versus control condition comparison (B = 0.063, SE = 0.024, p = .010) confirming the beneficial effect of prioritization on health behavior performance.

Does Prioritizing Two Health Behavior Goals Lead to Greater Behavior Change?

In the fifth block of analyses the nested comparison of Mono-priority Intervention versus Dual-priority Intervention conditions was significant, B= 0.060, SE= 0.029, p= .040, consistent with the idea that prioritizing two behaviors generates more behavior change than prioritizing one behavior (see Figure 2). Planned comparisons appeared to confirm this finding. In the Dual-priority Intervention condition, the two prioritized behaviors were performed more frequently than the non-prioritized behaviors (B = 0.103, SE = 0.035, p = .004) and there was no difference in the frequency of performance of the first prioritized and second prioritized behaviors in this condition (B = -0.053, SE = 0.050, p = .287).

We also tested whether prioritizing combinations of two behaviors led to better or worse subsequent performance. Out of the 15 combinations where n > 5, only two tests were significant: Prioritizing fruit and vegetable consumption plus limiting alcohol, and avoiding

continuous sitting plus flossing, both were associated with larger effects (*p*s < .05). We see no discernable pattern in these findings: Prioritizing any specific behavior did not influence the findings; nor was it the case that behaviors in the same domain (e.g., physical activity and avoiding sedentariness) or behaviors with the same outcome (e.g., diet and physical activity for weight loss) were especially likely to be performed. It appears that prioritizing two behaviors is effective regardless of the behaviors that are selected for prioritization.

Does Prioritization Come at a Cost for Performance of Non-prioritized Behaviors?

In the sixth and final block of analyses to test how prioritization affected the performance of non-prioritized versus prioritized behaviors, we computed the interaction between time and prioritization for the intervention conditions controlling for goal intentions. This interaction proved significant ($B = 0.130$, $SE = 0.031$, $p < .001$). Decomposition of the interaction term via simple slopes indicated that there was no significant effect of time for non-prioritized behaviors ($B = 0.006$, $SE = 0.012$, $p = .643$) whereas time had a significant positive effect for prioritized behaviors ($B = 0.141$, $SE = 0.034$, $p < .001$). Thus, goal prioritization increased performance of the target behaviors from baseline to follow-up but did not lead to a diminution in the performance of non-prioritized behaviors (see Figure 2).

Discussion

The present study extended previous research on goal prioritization by undertaking a field test in a larger sample, over a longer time, and in relation to multiple health behaviors; by comparing the impact of prioritizing one vs. two health behavior goals; and by assessing the implications of prioritization for behaviors that were not prioritized. The findings summarized in Table 1 appear to confirm the initial promise of prioritizing goals on health behavior performance (Conner et al., 2016; Geers et al., 2009). Our intervention was effective in

promoting the variety of health behaviors that participants elected to prioritize. These findings were observed relative to two different control conditions, and when goal intentions and past behavior were covaried in the analyses. These latter analyses offer a strong test as they rule out pre-existing differences in intention strength or previous performance as explanations for the effect of goal prioritization. We also obtained new evidence that prioritization is not only effective in improving rates of enactment of single behaviors but confers similar benefits for performance when two behaviors are prioritized. No support was obtained for the idea that goal prioritization inevitably means that other behaviors are sacrificed. Goal prioritization increased performance of the focal health behaviors without any adverse influence upon health behaviors that were not prioritized.

Implications of the Research

These findings have both theoretical and practical implications. At the theoretical level, the present results are more consistent with a value-based choice analysis (Berkman, 2018) of goal prioritization than the strength model (Baumeister et al., 2007). There was no evidence that prioritization effects extended only to a single behavior or that performance of other behaviors was compromised, as a limited resource model would suggest. Instead, consistent with the value-based choice perspective, participants appeared to flexibly mobilize effort to increase performance of either one or two health behaviors without adversely affecting other health behaviors.

The present study also offers the first test of goal prioritization as it pertains to multiple goal pursuit. Whereas most health behavior theories construe decisions and performance in relation to single behavioral goals (e.g., to exercise or not), from participants' perspective, intentions and actions may involve a choice set containing multiple behaviors that all need to be

accomplished during a given period (Lowe et al., 2017). Intervention research too has largely targeted individual health behaviors in interventions and comparatively less attention has been paid to changing multiple health behaviors (see Webb et al., 2010; Wilson et al., 2015, for reviews). Given the importance of performing a suite of behaviors for good health (Adams et al, 2019), interventions to promote multiple behavior change warrant greater prominence in future research (Geller et al., 2017; Prochaska et al., 2010). The present study contributes to this effort by showing that goal prioritization can be used to effectively promote two behaviors and engender equivalent behaviors for both behaviors as was observed for a single behavior.

At the practical level, the present study suggests that goal prioritization may qualify as an additional tool in behavioral medicine's toolbox of strategies for health behavior change. We observed that a brief intervention was effective in promoting goal priority over 8 weeks and led to increased performance of health behaviors over this period. Importantly, this improvement in performance was obtained for a range of health actions (e.g., diet, physical activity, oral health) and for both health-protective (e.g., physical activity, fruit and vegetable consumption) and health-risk (e.g., alcohol, snacking, sedentariness) behaviors.

Study Limitations

As this is one the earliest tests of the impact of goal prioritization on health behavior change, the present research inevitably leaves many questions unanswered. It is not yet clear whether prioritization is effective for a broader range of health behaviors than those examined here or whether prioritization could adversely affect performance of other health behaviors or progress in other goal domains (e.g., work, relationships). Although prioritizing two health goals led to greater behavior change compared to prioritizing one goal in the present study, both value-based choice and strength model analyses would suggest there must be limits to the number of

behaviors that can be prioritized. What that number is, and whether there are features of a behavior that make prioritization more versus less beneficial, are empirical questions that will need to be tackled in future research.

The present research has other limitations too. First, only 6 health-related behaviors were examined, and behavior was measured using self-reports. Although goal prioritization promoted objectively measured physical activity in a previous study (Conner et al., 2016, Study 3), further tests using nonreactive and validated behavior measures would be desirable. Second, although the present study recruited a larger and more representative sample compared to previous research, it was notable that participants who completed the study were slightly older and more likely to have completed higher education than those who did not complete the study. This may introduce a potential bias to the findings. Our study design did not allow us to further explore any effects of this bias on the findings and future studies could usefully further explore this issue. Replication studies in the general population should, however, be followed by tests in clinical samples. Patients who receive a diagnosis of cancer or heart disease may experience a "teachable moment" (e.g., Demark-Wahnefried et al., 2005) when a goal prioritization intervention could be especially opportune and there is evidence that goal realization strategies can be more effective for clinical, as compared to community, samples (Toli, Webb, & Hardy, 2016). Similarly, patients who encounter lapses in efforts to quit smoking could benefit from prioritization to help ensure that health goal pursuits get back on track. Relatedly goal prioritization interventions focusing on more than one behavior (e.g., increasing physical activity and reducing calorie consumption) may be useful in particular populations (e.g., people with overweight/obesity, individuals attempting to lose weight; those attempting to self-manage type 2 diabetes). Third and finally, although the follow-up period (8 weeks) was longer than previous studies, research

using longer-term follow-ups (6 months, 1 year) are needed to make the case that goal prioritization interventions warrant deployment at scale.

Conclusions and Future Directions

Notwithstanding these limitations, the present research suggests at least five key directions for future research (see Sheeran, Klein, & Rothman, 2017). First, mechanistic tests to elucidate how goal prioritization promotes health behavior performance would be valuable. Although there is evidence that increased goal activation, more proximal scheduling, greater energization in pursuit of the goal, and improved goal shielding explain how goal priority promotes performance (e.g., Unsworth et al., 2014), a simultaneous test of these different mechanisms of action is needed. It is worth noting that the current research design took account of the potential effect of incidental affect by randomizing participants to condition and by allowing them to self-set goals which are more immune to incidental emotional effects than researcher-set goals (Gendolla et al., 2021). Second, research should be directed towards developing improved strategies for promoting prioritization. Although the intervention tested here was effective, it will be important to test whether prioritization could be further enhanced by having participants elaborate on the information and affective value of the goal, and expectancies for attainment (Unsworth et al., 2014) or using mental contrasting (e.g., Oettingen, 2012). Third, it will be important to discover whether the impact of goal prioritization on health behaviors could be augmented by other intervention strategies. Goal prioritization involves increasing the importance attached to, and directing greater resources towards, a particular goal. However, the effective translation of goal importance and goal resources could be hampered by low self-efficacy or by failures to plan how to deal with obstacles effectively. The implication is that combining goal prioritization interventions with self-efficacy enhancement techniques (e.g.,

Ashford, Edmunds, & French, 2010; Prestwich et al., 2014) or implementation intentions (Gollwitzer & Sheeran, 2006) could lead to improved health behavior performance compared to goal prioritization on its own. Fourth, future research might usefully explore the extent to which behavior-, individual-, or group-level factors accentuate or attenuate the effects of goal prioritization. For example, self-efficacy (behavior-level factor), conscientiousness (individual-level factor), and socio-economic status (group-level factor) have been examined in relation to behavioral intentions and might be useful moderators to explore regarding goal prioritization effects. Fifth, future research might usefully explore emotional outcomes of health behavior change that accrues from goal prioritization. Given that prioritized goals have high affective value (Unsworth et al., 2014), it could be the case that attainment of prioritized goals engenders greater positive affect than attainment of non-prioritized goals. Each of these five directions for future research could benefit from the use of both experimental and mixed-methods approaches to provide appropriate tests and in-depth insights into the use of goal prioritization to prompt health behavior change.

In conclusion, the present research used a rigorous experimental design, large sample, and sophisticated multi-level analyses to test whether goal prioritization promotes health behavior change. Findings indicated that goal prioritization was effective in promoting multiple health behaviors, that prioritizing two health behavior goal conferred additional benefit beyond prioritizing a single goal, and that prioritization had no costs for the performance of non-prioritized behaviors. Goal prioritization would thus seem to constitute a new and promising psychological change technique that can and should be tested in future research.

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Table 1. *Summary of six blocks of analyses, measures and results.*

Analysis Block	Outcomes Analyzed	Results
a. Randomization and representativeness checks		
- comparison of 4 conditions at baseline	Demographics (age, gender, education, employment)	No significant differences (chi-squared, ANOVA F-test).
- comparison of those completing baseline only vs. baseline plus follow-up	Demographics (age, gender, education, employment)	Significant differences for age and education (chi-squared, F-test).
- comparison of dropout rates by condition	Dropout rates (see Figure 1)	No significant difference (chi-squared).
- comparison of baseline measures by condition	Baseline goal priority, goal intention, past behavior	No significant differences (beta from HLM).
b. Goal Priority Intervention Check		
- comparison of frequency of selection of each behavior for prioritization in the two prioritization conditions	Frequencies of selection of health behavior	Three behaviors more likely to be selected (taking the recommended levels of physical activity each week; consuming at least five portions of fruit and vegetables; avoiding eating unhealthy snacks each day).
- comparison of baseline measures for prioritized versus non-prioritized behaviors	Baseline goal intention, past behavior	Prioritized behaviors had higher goal intentions; no significant differences for past behavior (betas from HLM)
c. Intervention Effects on Goal Priority		
- comparison of follow-up goal priority by condition	Follow-up goal priority	Goal priority not significantly different between control conditions, significantly higher for intervention versus control conditions, significantly higher for prioritized versus non-prioritized behaviors (betas from HLM).
d. Impact of Goal Prioritization on Behavior Change		
- comparison of follow-up behavior by condition	Follow-up behavior	Behavior not significantly different between control conditions, significantly higher for intervention versus control conditions, significantly higher for prioritized versus non-prioritized behaviors (betas from HLM). Behavior significantly higher for intervention versus control conditions controlling for baseline goal intentions and past behavior (beta from HLM).
e. Does Prioritizing Two Health Behavior Goals Lead to Greater Behavior Change?		
- comparison of follow-up behavior in the prioritization conditions	Follow-up behavior	Behavior significantly higher for dual-priority versus mono-priority condition (beta from HLM). In dual-priority condition two prioritized behaviors performed significantly more than non-prioritized behaviors with no

		significant difference in performance between first and second prioritized behavior (betas from HLM).
f. Does Prioritization Come at a Cost for Performance of Non-prioritized Behaviors?		
- comparison of behavior change in the prioritization conditions	Baseline and follow-up behavior	Behavior significantly increased from baseline to follow-up for prioritized behaviors, with no significant change in non-prioritized behaviors (simple slopes from betas in HLM). See Figure 2.

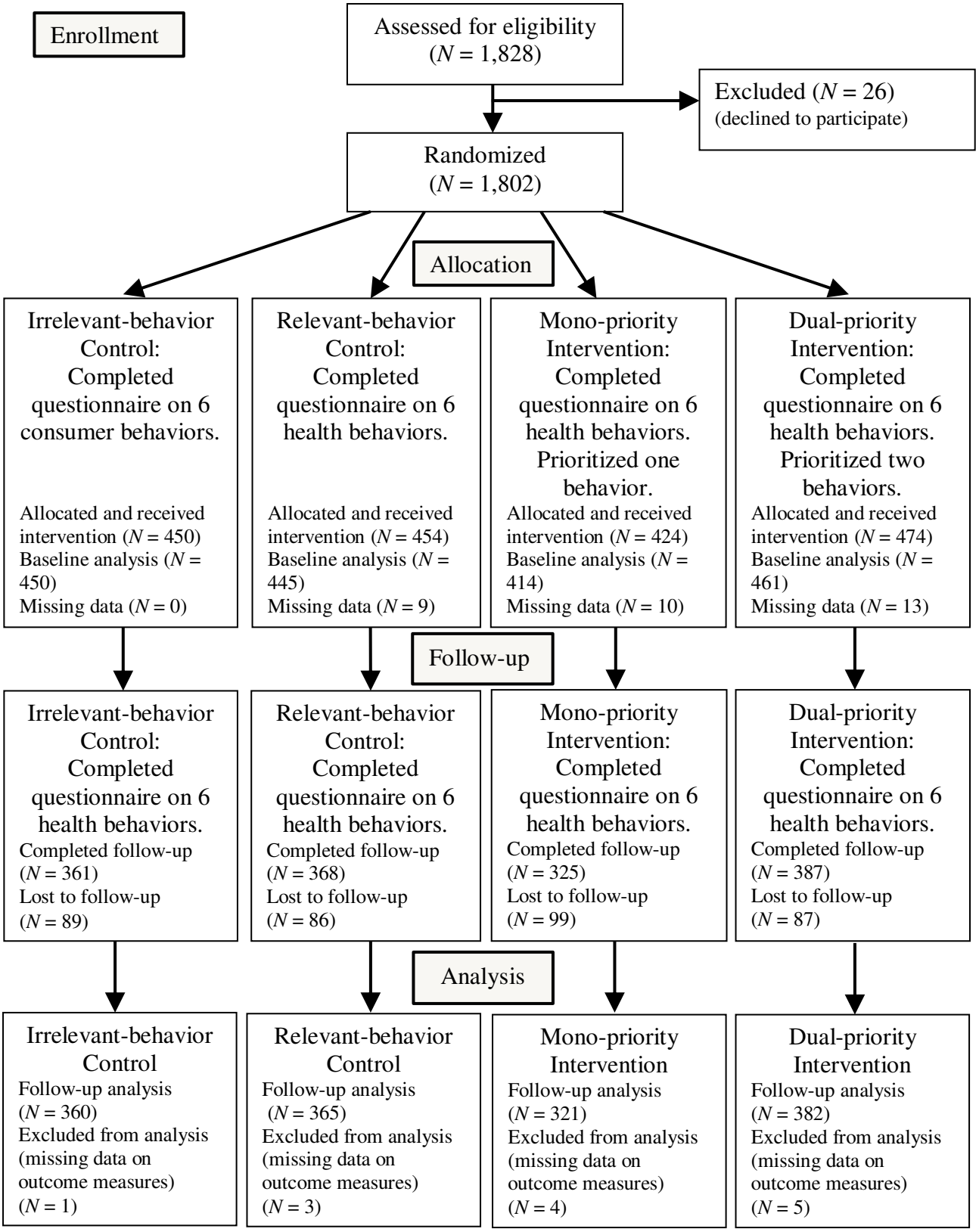

Figure 1. *Study design and participant flow diagram.*

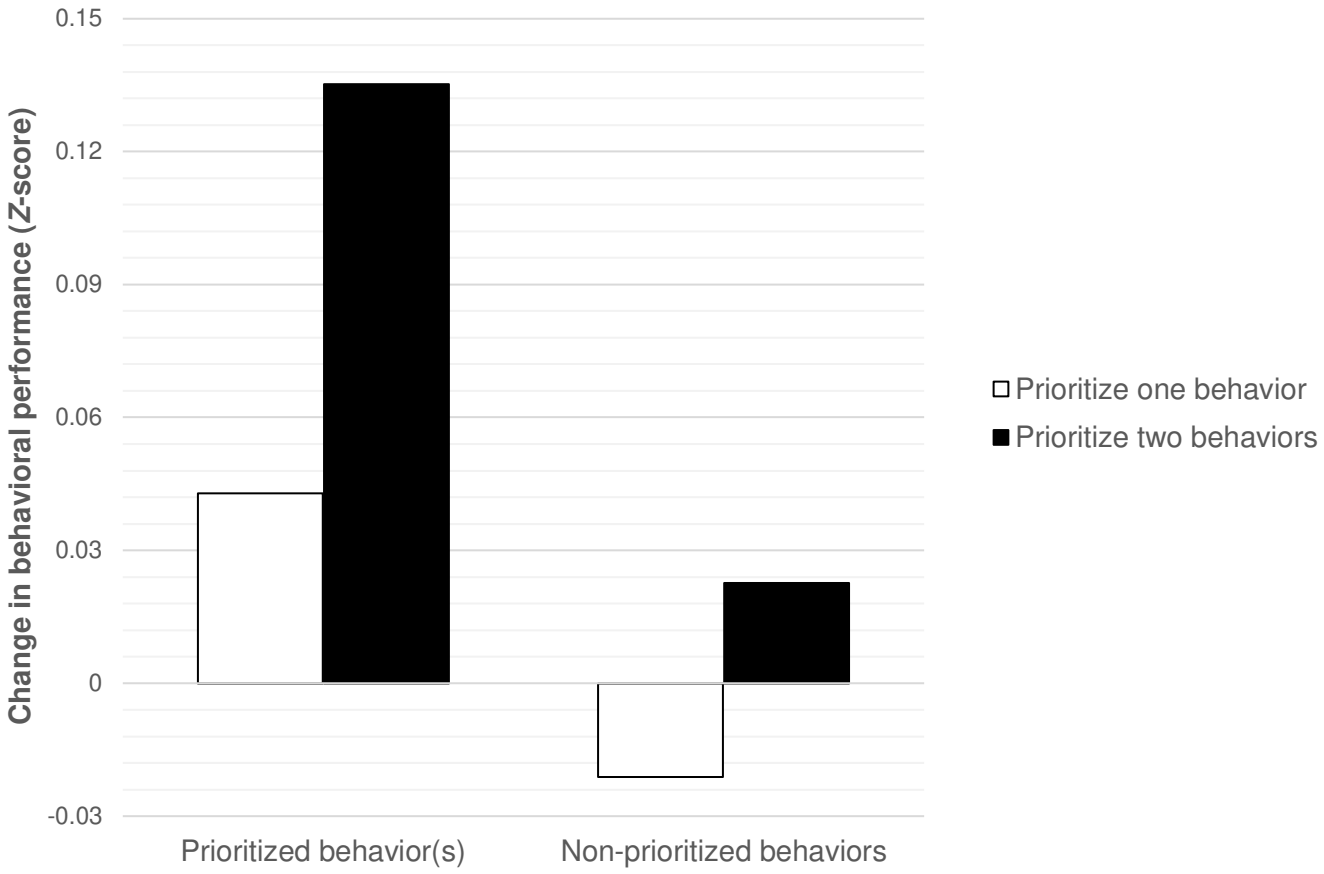

Figure 2. *Change in Behavioral Performance from Baseline to Follow-up for Prioritized and Non-prioritized Behaviors by Prioritization Condition.*
Note. Values represent changes in performance (difference z-scores) for one prioritized behavior and five non-prioritized behaviors (*Prioritize one behavior*) and two prioritized behaviors and four non-prioritized behaviors (*Prioritize two behaviors* condition).