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Conner, M orcid.org/0000-0002-6229-8143, Abraham, C, Prestwich, A orcid.org/0000-0002-7489-6415 et al. (5 more authors) (2016) Impact of goal priority and goal conflict on the intention–health-behavior relationship: Tests on physical activity and other health behaviors. *Health Psychology*, 35 (9). pp. 1017-1026. ISSN 0278-6133

<https://doi.org/10.1037/hea0000340>

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Impact of Goal Priority and Goal Conflict on the Intention-Health Behavior Relationship:

Tests on Physical Activity and Other Health Behaviors

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Date of acceptance: 10.12.15

Acknowledgements

Study 3 was supported by a grant from Unilever Research, UK; Study 4 was supported by a grant from the British Academy.

Impact of Goal Priority and Goal Conflict on the Intention-Health Behavior Relationship:

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Abstract

Objectives: Goal intentions are the key proximal determinant of behavior in a number of key models applied to predicting health behavior. However, relatively little previous research has examined how characteristics of goals moderate the intention-health behavior relations. The present research examined the effects of goal priority and goal conflict as moderators of the intention-health behavior relationship. **Methods:** The main outcome measures were self-reported performance of physical activity (Studies 1, 2 and 3) and other health behaviors (Study 4), and objectively measured physical activity (Study 3). Studies 1 and 4 used prospective correlational designs to predict later behavior from earlier cognitions. Studies 2 and 3 were experimental studies manipulating goal priority and goal conflict. Studies 1 and 2 used between-subjects designs while Studies 3 and 4 used within-subjects designs. **Results:** Goal priority significantly moderated the intention-health behavior relationship for physical activity (Study 1) and a range of protective and risk health behaviors (Study 4). Manipulations of goal priority significantly increased the intention-physical activity relationship when self-reported (Study 2) and objectively-measured (Study 3). In contrast, inconsistent effects were observed for goal conflict as an intention-behavior moderator. **Conclusions:** When goal priority is high then intentions are strong predictors of health behaviors. Further studies testing manipulations of goal conflict and in particular goal priority in combination with goal intentions are required to confirm their value as a means to change health behavior.

Key words: intentions; goal priority; goal conflict; intention-behavior relationship; health behavior.

A number of models widely used to predict health behaviors identify goal intention as the key modifiable cognitive antecedent of action. These include the theory of reasoned action (Fishbein & Ajzen, 1975), theory of planned behavior (TPB; Ajzen, 1991), model of interpersonal behavior (Triandis, 1980), protection motivation theory (Maddux & Rogers, 1983), social cognitive theory (Bandura, 2001), and prototype-willingness model (PWM; Gibbons, Gerrard, Blanton, & Russell, 1998). Generally these models have been successful in identifying the main determinants of goal intentions to perform a range of health behaviors. For example, McEachan, Conner, Taylor, and Lawton (2011) in a meta-analysis of the TPB as applied to health behaviors reported that attitude, subjective norms, and perceived behavioral control explained between 37% (abstinence behaviors) and 51% (safer sex behaviors) of the variance in intentions. However, reviews of the relevant literature indicate the impact of intention on health behavior to be more modest: medium-large magnitude in correlational studies ($r_+ = .43$, $k = 239$; McEachan et al., 2011) or small-medium magnitude in experimental studies ($d_+ = .36$, $k = 47$; Webb & Sheeran, 2006). Although studies have examined a variety of moderators of the intention-behavior relationship (see Cooke & Sheeran, 2004; Sheeran, 2002 for reviews), a relatively little studied weakness of all the above models is their focus on single goals or behaviors. Health behaviors are rarely pursued in isolation and are likely embedded in idiosyncratic systems of goal pursuit that cannot be fully understood in isolation (Abraham & Sheeran, 2003; Austin & Vancouver, 1996). Taking account of other goals may be one way to improve the power of goal intentions to predict behaviors.

One approach to examining the extent to which other goal intentions influence a target goal intention has been to examine the extent to which they enhance prediction of the target behavior. For example, Rhodes and Blanchard (2008) showed that intention to watch television predicted additional variance in physical activity over the intention to engage in physical activity (see also Richetin, Conner, & Perugini, 2011 on doing and not doing intentions).

However, the unknown and idiosyncratic nature of goal systems has meant that research in this area has tended to focus on perceptions of the impact of other goals.

Goal conflict refers to the extent to which pursuit of one goal reduces the ability to pursue another goal and can be contrasted with goal facilitation which refers to the extent to which pursuit of one goal enhances the ability to pursue another goal. Studies have shown these effects in various non-health behaviors (e.g., Locke, Smith, Erez, & Chah, 1994; Slocum, Cron, & Brown, 2002). More pertinently, Pesseau, Francis, Campbell, and Sniehotta (2011) reported that, after controlling for goal intentions and other variables, both goal conflict and goal facilitation predicted health professionals provision of physical activity advice in primary care. Similarly, in relation to physical activity, studies have shown that after controlling for intentions, then goal facilitation, but not goal conflict, predicted behavior (Li & Chan, 2008; Riediger & Freund, 2004), including between-subjects studies using self-reported behavior (Pesseau, Sniehotta, Francis, & Gebhardt, 2010) and within-subjects studies using objective measures of behavior (Pesseau, Tait, Johnston, Francis, & Sniehotta, 2013). Importantly, only Li and Chan (2008) and Pesseau et al. (2010) tested whether these goal measures moderated the relationship between intentions and behavior, although neither reported a significant effect. However, Li and Chan (2008) did report a significant 3-way interaction; goal intentions were better predictors of physical activity when stable (consistent with other work; e.g., Conner & Godin, 2008) but only among those with low goal conflict. In contrast, and somewhat unexpectedly, the pattern was reversed among those with high goal conflict.

Goal priority refers to the likely prioritization of one goal over another. A goal with higher priority is more likely to be activated and pursued with commitment of time and energy but a higher priority goal need not be in conflict with a lower priority goal. Goal priority has been comparatively less studied, particularly in relation to health behaviors. Guinote (2007) showed across four studies that personal power facilitated goal priority and goal-consistent

behavior. In addition, Geers, Wellman, and Lassiter (2009) showed that goal priority moderated the relationship between dispositional optimism and goal engagement and attainment across five studies. For example, Study 1 showed that optimism positively predicted amount of exercise engaged in when this was a prioritized goal, but negatively predicted amount of exercise when this was a non-prioritized goal. However, no studies appear to have examined the extent to which goal priority moderates the goal intention-behavior relationship.

The above reviewed research on goal constructs and goal intentions and their impact on health behavior suffer from a number of important weaknesses that the present research attempts to address. First, the vast majority of previous studies have focused on examining goal constructs such as goal facilitation and conflict as direct predictors of behavior (but see Li & Chan, 2008; Pesseau et al., 2010), in some cases controlling for goal intentions. However, little attention has been given to the distinction between goal priority and goal conflict. The present research addressed this issue by testing the extent to which goal priority and conflict moderate the intention-behavior relationship across four studies. Second, previous studies have exclusively focused on correlational relationships among goal constructs and behavior. In attempting to understand the causal role that goal constructs might play, the present research complements correlational studies (Studies 1 and 4) with experimental studies (Studies 2 and 3) that manipulate these goal constructs. Third, although previous research has generally benefited from using prospective designs, few studies control for the effects of past behavior (see Li & Chan, 2008 for an exception). This is an important consideration in determining that intentions direct changes in behavior. In the present research, Studies 2-4 each control for past behavior. Relatedly, only Pesseau et al. (2013) have examined goal construct effects for an objective measure of behavior using a within-subjects design. In the present research we test goal construct effects using an objective measure of behavior, using a within-subjects design, but manipulate goal constructs and control for objectively measured past behavior (Study 3).

Fourth, although studies have compared the effects of goal conflict and facilitation, no studies have directly compared goal priority and goal conflict. All of the studies presented here directly compared the effects of goal priority and goal conflict. Fifth, the majority of studies have focused on a single behavior, usually physical activity, without examining the effects of goal constructs on a broader range of health behaviors. The present research partly follows this tradition in focusing on physical activity (Studies 1-3) but also examined if similar effects would be observed across a broader range of health protective and risk behaviors (Study 4).

Sixth, the only previous study to examine the relationship between goal measures and intention stability (Li & Chan, 2008) observed the 3-way interaction discussed above. In the present research we specifically tested the power of goal priority and conflict as moderators of the intention-behavior relationship to mediate the effect of intention stability (Study 1). This is important because the stability of intentions has been shown to be an important moderator of the intention-behavior relationship. For example, Conner and Godin (2007) reported that across seven tests with over 1000 participants the average intention-health behavior correlation was 0.60 in that half of the sample with more stable intentions but only 0.27 in that half with less stable intentions. Intention stability has also been shown to mediate the effects of a number of other moderators of the intention-behavior relationship (Sheeran & Abraham, 2003). Showing that goal priority and/or goal conflict can mediate this effect would support the value of targeting one or both of these goal constructs.

In summary, across four studies, the present research tested whether prioritizing goals and/or minimizing goal conflict increases the extent to which intention predicts behavior. Identifying the psychological processes which make it more likely that intention will be translated into action can aid behavior change intervention development. The present research focused on goal priority and goal conflict as one way to take account of the interrelationship among goals and improve the power of intentions to predict behavior.

Study 1: Goal Priority and Conflict and the Intention-Physical Activity Relationship

Study 1 used a longitudinal correlational design to test whether measures of goal priority or goal conflict moderated the intention-behavior relationship for physical activity, and whether these effects mediated the moderating effect of intention stability on the intention-behavior relationship.

Method

Participants and procedure. Participants were a convenience sample of UK University students entered into a prize draw (2 x £50, approximately \$80) for completing anonymous paper and pencil or on-line questionnaires at three time points each separated by two weeks. A total of 284 students completed measures at baseline. Analyses were based on the 237 students who completed measures at all time-points ($M = 21.3$ years, $SD = 3.91$; 139 women, 98 men) and were representative of the initial sample on age, gender, and baseline intentions ($ps > .25$).

Measures. The questionnaires contained measures of: intention at time 0 (baseline); intention, goal priority, goal conflict at T1 (2 weeks); and measures of self-reported exercise behavior at T2 (4 weeks); along with various additional measures taken at each time point (not reported here). Full measures for each study are available as supplementary materials. Data were analyzed in SPSS (version 20, SPSS Inc).

Intentions were assessed by 10 items (e.g., ‘I intend to exercise vigorously at least 3 times per week for the next two weeks, definitely do not – definitely do’; scored 1-7 and averaged; Cronbach’s $\alpha = .97, .98$ for T0 and T1 respectively). Goal priority was assessed by 7 items (e.g., ‘I would be prepared to give up many other goals and priorities to exercise vigorously at least 3 times per week for the next 2 weeks, strongly disagree – strongly agree’; scored 1-7 and averaged; $\alpha = .92$). Goal conflict was assessed by 3 items (e.g., ‘This goal [exercising vigorously at least 3 times per week for the next 2 weeks] conflicts with some of my other goals, strongly disagree – strongly agree’; scored 1-7 and averaged; $\alpha = .84$). Exercise behavior was assessed by 2 items (‘I have exercised vigorously at least 3 times per week for the last 2 weeks, definitely no – definitely

yes'; 'Over the last 2 weeks I have exercised vigorously ____ times per week on average'; items were standardized and averaged; $r = .51$). Intention stability was assessed based on intention scores at T0 and T1. Consistent with previous operationalizations (e.g., Conner et al., 2000; Sheeran & Abraham, 2003), four indices of intention stability were used: (i) the within-participants correlation between intention items at T0 and T1; (ii) the sum of the absolute differences between intention items at T0 and T1; (iii) the absolute difference between the sum of intention items at T0 and T1; and (iv) the number of items that exhibited change between T0 and T1. Reliability across the four indices was satisfactory ($\alpha = .78$) and these were therefore averaged and scored such that higher scores indicate greater stability.

Results

Examination of the means and SDs on measured variables indicated that they were not skewed and showed reasonable levels of variability. Intentions were the strongest correlates of behavior ($r = .757$), although both goal measures were also significantly correlated with both behavior (goal priority, $r = .571$; goal conflict, $r = -.561$) and intentions (goal priority, $r = .752$; goal conflict, $r = -.594$), i.e. intention and behavior were higher in those with higher goal priority and lower goal conflict. Goal conflict and goal priority were also moderately correlated ($r = -.470$).

Multiple regression was used to test the moderating effects of intention stability, goal priority and goal conflict on the intention-behavior relationship by regressing behavior on the predictor variables (intention and moderator) and interactions between each moderator and intention (based on mean-centred variables). At step 1, intention, intention stability and the intention stability x intention interaction were entered, explaining 58.6% of the variance in behavior, $F(3,233) = 109.7$, $p < .001$ (Table 1). Intention and the interaction term were significant at this step. Simple slopes analyses indicated that intention was a significant predictor of behavior at all levels of intention stability but became a stronger predictor as stability increased from low (M-1SD: $B = .288$, $p < .001$) to moderate (M: $B = .325$, $p < .001$) to high (M+1SD: $B = .362$, $p <$

.001). Step 2a added goal priority and the goal priority x intention interaction to the step 1 variables, explaining an additional 1.4% of the variance in behavior, $F(2,231) = 4.12, p < .05$. Intention and the goal priority x intention interaction were significant at this step, while the intention stability x intention interaction became non-significant. Simple slopes analyses indicated that intention was a significant predictor of behavior at all levels of goal priority but became stronger as priority increased from low (M-1SD: $B = .311, p < .001$) to moderate (M: $B = .390, p < .001$) to high (M+1SD: $B = .469, p < .001$). Step 2b added goal conflict and the goal conflict x intention interaction to the step 1 variables, explaining 2.5% additional variance in behavior, $F(2,231) = 7.39, p < .001$. Intention, goal conflict and the goal conflict x intention interaction were significant at this step, while the intention stability x intention interaction became non-significant. Simple slopes analyses indicated that intention was a significant predictor of behavior at all levels of goal conflict but became weaker as goal conflict increased from low (M-1SD: $B = .346, p < .001$) to moderate (M: $B = .298, p < .001$) to high (M+1SD: $B = .250, p < .001$).

At step 3 both goal priority and goal conflict and their interactions with intention were added to step 1 variables and explained an additional 3.2% of the variance in behavior, $F(4,229) = 4.86, p < .001$. Intention, goal conflict and the goal priority x intention interaction were significant at this step, while the intention stability x intention interaction became non-significant. Simple slopes analyses indicated that intention was a significant predictor of behavior at all levels of goal priority but became stronger as priority increased from low (M-1SD: $B = .283, p < .001$) to moderate (M: $B = .347, p < .001$) to high (M+1SD: $B = .411, p < .001$).

In order to test the extent to which the interaction between intention and goal priority or between intention and goal conflict mediated the effect of the intention stability x intention interaction on behavior we used Hayes (2013) PROCESS approach. This uses a bootstrapping approach, in this case with 10,000 resamples of random data, to estimate the indirect path from the intention stability x intention interaction to behavior via either the intention x goal priority or the

intention x goal conflict interaction while controlling for other variables. As the 95% confidence intervals around the estimated indirect effects did not contain zero this supports significant mediation for each of the intention x goal priority (95%CI .0061, .0362) and intention x goal priority (95%CI .0028, .0281) interactions.

Discussion

Study 1 showed that measures of either goal priority or goal conflict moderated the intention-behavior relationship and this effect mediated the moderating effect of intention stability on the intention-behavior relationship. However, when goal conflict and goal priority were simultaneously considered it was only goal priority that was a significant moderator of the intention-behavior relationship. Although promising in showing that goal conflict and particularly goal priority may be important characteristics of strong intentions that better predict behavior, Study 1 data are correlational and do not control for past behavior. Study 2 was designed to address these issues.

Study 2: Manipulating Goal Priority and Conflict for Physical Activity

Study 2 again focused on physical activity and compared the impact of manipulating goal priority or goal conflict against a control condition in an experimental design and observing impacts on the intention-behavior relationship, whilst also controlling for past behavior.

Method

Participants and Procedure. Participants were a convenience sample of 160 University students ($M = 22$ years, $SD = 3.11$; 96 women, 64 men) who privately completed two anonymous questionnaires concerning physical activity separated by two weeks (T0 and T1). We were able to match data across time point for 155 participants (50 control, 59 goal priority, 46 goal conflict) based on personally generated codes they provided at each time point.

Measures. Intentions, goal priority, goal conflict, and exercise behavior were assessed (each with the same items used in Study 1) plus a number of items not reported here. Intentions

were assessed as the mean of 10 items at T0 ($\alpha = .97$). Goal priority was assessed as the mean of 7 items at both time points ($\alpha = .94, .95$ for T0 and T1 respectively). Goal conflict was assessed as the mean of 3 items at both time points ($\alpha = .69, .81$ for T0 and T1 respectively). Exercise behavior was assessed by 2 items at both time points and standardized and averaged; ($r = .88, .89$ for T0 and T1 respectively). Exercise behavior at T1 was the key outcome variable.

Manipulation. At baseline (T0) respondents read a definition of vigorous exercise ('By 'vigorous exercise' in the questions that follow we mean taking part in physical activity, including sport, for more than 15 minutes at a time. For example, this would include exercise activities such as jogging, running, cycling, swimming lengths, football, hockey or attending exercise classes. It would not include incidental or mild exercise activities such as walking, disco dancing, relaxing in a swimming pool, bowling, or golf') and then completed a number of measures in relation to this behavior. Using a random number generator, respondents were then randomized to one of three conditions and required to write down two sentences (control condition: 'About your friends'; goal priority condition: 'About prioritizing exercising over other goals'; goal conflict condition: 'About dealing with the conflict between exercising and other conflicting goals'). In the goal priority and conflict conditions it was specified that the sentences should relate to the goal of exercising vigorously at least 3 times per week for the next two weeks. The manipulations used in studies 2 and 3 are available as supplementary materials. Participants' sentences were coded for compliance with instructions and all respondents were judged to have complied. Data were analyzed in SPSS (version 20, SPSS Inc).

Results

MANOVA indicated no significant differences between those randomized to the three conditions at T0 on intentions, past behavior, goal priority or goal conflict, Pillai's Trace $F(8, 308) = .72$, ns (univariate $F_s < .80$), suggesting randomization was successful. The goal priority condition significantly increased goal priority ratings between T0 and T1, $t(59) = 4.31$, $p <$

.001. However, the goal conflict condition did not significantly reduce goal conflict ratings between T0 and T1, $t(46) = 0.47$, ns. MANOVA of behavior, goal priority, and goal conflict at T1 revealed an overall significant effect, Pillai's Trace $F(6, 308) = 3.33$, $p < .01$. Examination of univariate effects indicated a non-significant effect for behavior ($F(2,155) = 2.26$, $p = .10$), a significant effect for goal priority ($F(2,155) = 4.97$, $p < .01$) and a non-significant effect for goal conflict ($F(2,155) = 0.92$, ns). Post-hoc tests indicated that behavior was significantly higher ($p < .05$) in the goal priority ($M = 0.16$, $SD = 1.10$) compared to the control condition ($M = -0.23$, $SD = 0.79$), while goal priority ratings were significantly lower in the control ($M = 3.05$, $SD = 1.43$) compared to either the goal priority ($M = 3.91$, $SD = 1.67$) or goal conflict ($M = 3.85$, $SD = 1.56$) conditions. No other differences were significant.

We used multiple regression to test the impact of intentions on behavior controlling for past behavior separately for each condition (Table 2). When entered at step 1, intention was a strong predictor in all three conditions, explaining significant proportions of the variance in behavior. For each condition, entering past behavior at step 2 explained significant additional variance in behavior, with the effects of intention remaining significant in all three conditions. However, examination of the results (Table 2) indicated that the impact of intention on behavior was considerably greater for the goal priority condition compared to either other condition.

In order to test the significance of the difference between conditions in the power of intentions to predict behavior after controlling for past behavior three additional regressions to compare each pair of conditions were conducted. In these regressions we tested the power of a dummy coded condition variable x intention interaction (based on mean-centred variables) to predict behavior after controlling for intention, past behavior and the dummy coded condition variable. For comparing the goal priority (coded 1) against the control condition (coded 0), the interaction term explained a significant additional 1.5% of the variance in behavior, $F(1,112) = 7.33$, $p < .01$. The significant positive beta weight for the interaction term ($B = .136$, $SE = .050$, p

< .01) confirmed the findings in Table 3 that intentions were significantly stronger predictors of behavior in the goal priority compared to the control condition. When comparing the goal conflict condition (coded 1) against the control condition (coded 0), the interaction term explained a non-significant additional 0.5% of the variance in behavior, $F(1,93) = 2.48$, ns. The non-significant beta weight for the interaction term ($B = .078$, $SE = .050$, ns) indicated that intentions were not significantly stronger predictors of behavior in the goal conflict compared to the control condition. When comparing the goal priority condition (coded 1) against the goal conflict condition (code 0), the interaction term explained a non-significant additional 0.7% of the variance in behavior, $F(1,108) = 2.44$, ns. The non-significant beta weight for the interaction term ($B = .095$, $SE = .061$, ns) indicated that intention was not a significantly stronger predictor of behavior in the goal priority condition compared to the goal conflict condition.

Discussion

Study 2 showed that manipulations of goal priority but not goal conflict increased exercise behavior and produced intentions that were significantly stronger predictors of behavior compared to a control condition controlling for past behavior. The differences between the goal priority and goal conflict conditions were non-significant. Study 2 findings extend those of Study 1 by showing that a simple manipulation of goal priority can increase the power of intention to predict behavior even when controlling for past behavior. However, Study 2 was limited by the use of self-reported measures of behavior and a between-subjects design. In addition, Studies 1 and 2 were both limited by a focus on student samples. Study 3 was designed to address these issues.

Study 3: Impact of Manipulating Goal Priority and Conflict on Objective Physical Activity

Study 3 aimed to test the extent to which manipulations of goal priority or goal conflict moderates the intention-physical activity relationship in a sample of adults. Studies 1 and 2 used between-subjects analyses where the behavior of individuals with different intentions is compared. Although a common design in this area, it is not unproblematic because such

analyses address whether, for example, individuals with stronger intentions are more likely to perform a health behavior compared to individuals with weaker intentions. Of more interest theoretically are within-persons analyses that compare the extent to which levels of intention and behavior covary within an individual. Study 3 took advantage of multi-level modelling in order to examine the within-subject relationship between an individual's intention to be non-sedentary or to be physically active and their subsequent (objectively assessed) behavior by measuring these variables on multiple days and combining these effects across participants.

Method

Participants and procedure. Participants were a convenience sample of 73 adults ($M = 23$ years, $SD = 6.22$; 51 women, 22 men) recruited to take part in a study on physical activity and paid £30 (approximately \$50). At baseline (T0) respondents attended the laboratory and completed measures of age and gender along with a number of other measures not reported here, were fitted with a wrist worn accelerometer and instructed to wear it 24 hours per day for the next week. They were also given a seven day diary that contained a definition of moderate and vigorous activity and a number of measures (not all reported here) that they were instructed to complete at the end of each day. One week later (T1) participants returned the diary, and using a random number generator were randomized to condition and completed the appropriate intervention. They then also received a fourteen day daily diary that they were required to complete at the end of each day and were instructed to keep wearing the accelerometer 24 hours per day. The intervention (see below) was displayed on the first page of the diary and participants were asked to review it each day. Two weeks later (T2) participants returned the second diary, handed back the accelerometer, and completed additional measures (not reported here). Due to missing data and exclusion criteria (see below) the final sample consisted of 54 participants split between the control ($N = 19$), goal priority ($N = 18$), and goal conflict ($N = 17$) conditions.

Manipulation. This was similar to that used in Study 2 and involved reading a definition of moderate/vigorous exercise and then writing down two sentences on either friends (control), prioritizing exercising (goal priority), or dealing with conflicts with exercising (goal conflict). Participants' sentences were coded for compliance with instructions and all respondents were judged to have complied. Participants' sentences appeared on the front of the 14-day diary.

Measures. Both diaries contained single-item daily measures of: Non-Sedentary intentions ('I intend to be sedentary as little as possible tomorrow, strongly disagree – strongly agree'; scored 1-7), Activity intentions ('Tomorrow I intend to engage in at least 30 minutes moderate or vigorous intensity physical activity, strongly disagree – strongly agree'; scored 1-7), and Self-reported activity ('How many minutes moderate or vigorous intensity physical activity did you engage in today?'). Objective activity was assessed by the wrist worn tri-axial accelerometer (GENEActiv, UK; Esliger, Rowlands, Hurst, Catt, Murray, & Eston, 2011) set to record at 60 Hertz. As raw accelerometer counts are sensitive to all movement they were filtered with recommended procedures and cut offs applied to focus on METs of moderate or vigorous physical activity (Mâsse et al., 2005) on each day. This was our key outcome measure and best corresponded to our activity intention measure.

Analyses. The analyses were conducted in SPSS (version 20, SPSS) and Hierarchical Linear Modeling using HLM7 (version 7, SSI; Raudenbush & Bryk, 2002). To allow variation across individuals we used random effects. The data contained a two level hierarchical structure, Level 1 being the within-person variation and Level 2 being the between-person variability. The Level 1 predictor variables were centered around the group mean, while the level 2 predictor variables were grand mean centered. Level 1 variables were the non-sedentary and activity intentions and self-reported and objective activity assessed on post-intervention days. Level 2 variables were baseline levels of non-sedentary and activity intentions (computed by averaging across responses to the first six days; T0 to T1), objective baseline level of

activity (computed by summing the daily levels of moderate and vigorous METs activity recorded by the accelerometer over the first six days; T0 to T1), and dummy coded variables to indicate condition. The data was arranged such that the intention measures on one day were used to predict behavior on the next day (using days 8 to 20 to ensure only full days of post intervention activity were analyzed). Participants were excluded if any level 2 data was missing or if less than 10 days of level 1 data were available. ANOVA and chi-squared tests revealed no significance differences between those retained and those excluded or between the three conditions on age or gender, $p > .30$.

The above procedures resulted in a total of 711 person-day data points spread across 54 individuals that were used in analysis. The analyses predicted objective activity separately within each condition based on the two intention measures (level 1) and baseline intention and past behavior (level 2). For each model we report the -2 log-likelihood statistic (-2LL) to indicate model fit and a chi-squared test of the change in -2LL compared to a baseline intercept-only model to indicate significance of improvement of fit. For each predictor we report unstandardized coefficients, standard errors, and standardized coefficients (all based on the population-average model with robust standard errors). In order to compare any variations in the predictive power of intentions between conditions we subsequently conducted regressions across pairs of conditions. At step 1 we entered the same variables as above plus the dummy coded condition variable (level 2) and at a second step the dummy coded condition variable x intention cross-level interaction (based on mean-centred variables). Where the interaction term was significant, we decomposed it using the procedures outlined by Preacher (Model 3) at <http://www.quantpsy.org/interact/hlm2.htm>.

Results

Table 3 reports the results of the analyses to predict objectively measured activity in each condition. After controlling for baseline measures of non-sedentary intention, activity

intention, and objective activity, Table 3 indicates that activity intention but not non-sedentary intention was a significant predictor of activity in the goal priority condition but not in the other conditions. This supports the findings of Study 2 in showing that manipulations of goal priority but not goal conflict increased the intention-behavior relationship. The intercepts in Table 3 did not differ indicating the interventions did not significantly change behavior.

A multi-level model to test the significance of the difference between conditions, indicated that, when comparing the goal priority condition (coded 1) against control condition (coded 0), adding a condition x intention interaction term significantly improved the model fit, $\chi^2(1) = 6.8, p < .01$. In addition the interaction term was significant, $B = 41.567, SE = 17.367, p < .05$. Decomposition of the interaction confirmed the findings in Table 3, activity intentions were unrelated to objective behavior in the control condition ($B = 8.047, SE = 14.339$) but significant positive predictors of behavior in the goal priority condition, $B = 49.615, SE = 10.077, p < .001$. For comparing the goal conflict condition (coded 1) against control condition (coded 0) the addition of the interaction term did not significantly improve the model fit ($\chi^2(1) = 3.4, ns$) and the interaction term did not approach significance, $B = 4.617, SE = 26.708$. For comparing the goal priority condition (coded 1) against goal conflict condition (coded 0) the addition of the interaction term significantly improved the model fit ($\chi^2(1) = 5.8, p < .05$) although the interaction term was only marginally significant, $B = 19.174, SE = 18.337, p = .12$. Similar results were found using self-reported activity as the outcome variable although the differences between conditions were not statistically significant.

Discussion

The findings from Study 3 replicate and extend those of Study 2. In within-subjects analyses, activity intentions were stronger predictors of objective activity in the goal priority condition compared to the control and goal conflict conditions. This difference was only statistically significant for the goal priority versus control conditions (controlling for baseline intention

measures, baseline objective activity and daily non-sedentary intentions). Nevertheless the finding is notable in that it shows that individual's activity intentions on one day are stronger predictors of their objectively assessed activity on the next day in a condition designed to increase the priority of activity goals compared to a control condition. Unlike Study 2 no significant effects of condition on behavior were observed. However, a weakness of Study 3 (and Studies 1 and 2) is the focus on a single health protection behavior, namely physical activity. Study 4 aimed to address this weakness by assessing the moderating effects of goal priority across a broader range of protection and risk health behaviors in a large sample of adults, again using within-subjects analyses.

Study 4: Impact of Goal Priority on Multiple Health Behaviors

Given that Studies 1-3 showed the superiority of goal priority over goal conflict as intention-behavior moderators, Study 4 focused solely on goal priority. The aim was to test the extent to which goal priority moderated the intention-behavior relationship across a range of health behaviors controlling for the impact of past behavior. Like Study 3, we used a within-subjects design but in this case to examine how the intention-behavior relationship varied within individuals across a number of different behaviors as a function of level of goal priority for each behavior. In particular, we examined whether the moderating effect of goal priority on the intention-behavior relationship was restricted to health protection behaviors such as physical activity as examined in Studies 1-3 or also extended to risk behaviors such as drinking alcohol.

Method

Respondents and Procedure. Participants were recruited through a variety of means (e.g., local newspaper advert) offering £20 (approximately \$40) worth of gift vouchers for completion of three postal questionnaires (each completed one month apart; T0, T1, T2). The current analyses focus on data from the last two time points (T1, T2) when the constructs of interest were measured and comprised 348 participants (approximately 62% of the number of

questionnaires sent out at baseline) including 261 females and 87 males ($M = 39$ years, $SD = 8.22$; other aspects of the data were reported in [removed to preserve anonymity]). The sample was similar to the population of England (Census data, 2011) from which they were drawn for age and education, but more likely to be female.

Measures. Participants completed questionnaires tapping the same constructs for each of 9 health-protection (eat 5 fruit and vegetables per day, wear a helmet when riding a bicycle, take recommended levels of physical activity, exercise regularly, eat a low fat diet, use sunscreen of at least 15SPF when exposed to the sun, take vitamin supplements, brush teeth twice a day, floss teeth daily) and 6 health-risk (binge drinking, drink more than the recommended daily limits of alcohol, smoking, using illegal drugs, exceeding the posted speed limit when driving, drinking and driving) behaviors. Intention, goal priority, and past behavior were assessed at T1 and behavior at T2. Additional measures were taken but are not reported.

Intention was measured by two items for each behavior (e.g., ‘I intend to eat 5 portions of fruits and vegetables per day over the next four weeks, strongly disagree-strongly agree’; scored 1-7 and averaged; mean $r = .60$). Goal Priority was measured by one item for each behavior (e.g., ‘I would prioritize eating 5 portions of fruits and vegetables per day over other goals important to me, strongly disagree-strongly agree’; scored 1-7). This single item strongly correlated with the full seven item scale used in Study 1 ($r = .807$) and Study 2 ($r = .883$). Past Behavior (T1) and Behavior (T2) were measured using a single item by asking participants to record the number of days on which they had engaged in the behavior (e.g., ‘On how many days in the past four weeks have you eaten 5 portions of fruits and vegetables?’). For sunscreen use, the question posed was: ‘In the past four weeks I have used sunscreen of at least 15SPF when exposed to the sun, never-always’, scored 1-7. We dichotomized both behavior measures because they were skewed and also to allow us to conduct analyses across all behaviors (0 indicated not performing the more healthy behavior; 1 indicated performing the more healthy

behavior once or more than once).

Analyses. Data were analyzed in SPSS (version 20, SPSS Inc) and HLM (version 7, SSI). A number of participants had missing data on at least one variable and were excluded. ANOVA and chi-squared tests revealed no significance differences between those retained and excluded on age, gender, or highest educational qualification, $p_s > .30$. This resulted in a total of 3946 person-behavior data points spread across 348 individuals that were used in analysis. As behavior is clustered within individuals we used HLM to test the relationship between intentions measured at T1 and behavior measured at T2 and the extent to which this was moderated by goal priority (controlling for past behavior at T1). To allow variation across individuals we used random effects and the Bernoulli model (due to the dichotomous nature of the dependent variable) with predictor variables centered around the group mean.

We initially computed a baseline intercept only model to compare against other models (step 0). At step 1 the model included the level 1 predictors of intention, past behavior, and goal priority. At step 2 we added the interaction between intention and goal priority (based on mean-centered variables). In order to test for differences between health protection and risk behaviors, at step 3 we added the dummy coded protection versus risk behavior variable, the protection versus risk behavior x intention and protection versus risk behavior x goal priority interactions, and the protection versus risk behavior x intentions x goal priority interaction. For each step we report the -2 log-likelihood statistic (-2LL) to indicate model fit and a chi-squared test of the change in -2LL compared to the earlier model to indicate the significance of any improvement of fit. For each predictor we report unstandardized coefficients, standard errors, odds ratios and 95% confidence intervals around these odds ratios (all based on the population-average model with robust standard errors). The key test was significance of the intention x goal priority interaction (step 2) and the protection versus risk behaviors x intentions x goal priority interaction (step 3). Significant interactions were decomposed using

the procedures outlined by Preacher (Model 1) at <http://www.quantpsy.org/interact/hlm2.htm>.

Results

Multilevel modelling (Table 4, Step 1) to predict behavior indicated that adding intention, past behavior, and goal priority significantly reduced the -2LL compared to the intercept only model, $\chi^2(3) = 672.3, p < .001$. At this step the coefficients for past behavior, intention and goal priority were significant. Higher levels of past behavior, intention and goal priority were associated with greater likelihood of performing the behavior. Adding the goal priority x intention interaction to the model (Table 4, Step 2) significantly reduced the -2LL, $\chi^2(1) = 44.7, p < .001$. Past behavior, intention, goal priority and the goal priority x intention interaction were significant at this step. Greater likelihood of performing the behavior was associated with higher levels of past behavior, intentions and goal priority. Decomposition of the interaction term indicated that the impact of intention on behavior increased as goal priority increased. The impact of intentions on behavior was significant at all levels of goal priority, however it was weakest when goal priority was lowest (M-1SD; $B = .248, p < .001$), stronger at moderate levels of goal priority (M; $B = .293, p < .001$), and strongest at highest levels of goal priority (M+1SD; $B = .338, p < .001$). Adding protection versus risk behavior, the two 2-way interactions and the 3-way protection versus risk behaviors x intention x goal priority did not significantly reduce the -2LL, $\chi^2(4) = 7.2, ns$. Importantly the 3-way interaction was not significant ($B = 0.027, p = .09$) at this step indicating that the 2-way interaction between intentions and goal priority did not significantly vary between protection and risk behaviors.

Discussion

Study 4 shows that goal priority moderates the intention-behavior relationship in a within-subjects design when controlling for past behavior across a range of protection and risk health behaviors. Intentions were stronger predictors of behavior when goal priority was high. Crucially there was no evidence that this moderating effect of goal priority on intention-

behavior relations significantly differed between health protection and health risk behaviors, suggesting the effect generalizes across a range of health behaviors.

General Discussion

Across four studies we showed the moderating effects of goal prioritization on the intention-behavior relationship. Higher levels of goal prioritization were associated with stronger intention-behavior relationships for both physical activity (Studies 1-3) and across a broad range of health protection and risk behaviors (Study 4). This was true in both correlational (Studies 1 and 4) and experimental (Studies 2 and 3) studies, using between-subjects (Studies 1 and 2) and within-subject (Studies 3 and 4) designs and analyses, in both student (Studies 1 and 2) and general adult (Studies 3 and 4) populations, and when controlling for intention stability (Study 1) or past behavior (Studies 2-4). Importantly Study 3 showed these effects for an objective measure of behavior. Much weaker effects were found for goal conflict. Lower levels of goal conflict were associated with stronger intention-behavior relationships in Study 1, but this effect disappeared when controlling for goal priority. A goal conflict manipulation generated intentions that were stronger predictors of behavior compared to a control condition (Study 2) but this difference was not statistically significant.

The present work confirms and extends previous work (Li & Chan, 2008; Penseau et al., 2010, 2011, 2013) in a number of important ways. First, we show consistent effects, for goal priority, on the intention-behavior relationship: as goal priority increases so does the intention-behavior relationship (Studies 1-4). Second, we show similar findings in both correlational (Studies 1 and 4) and experimental (Studies 2-3) studies. Third, we show these effects hold when controlling for the effects of past behavior (Studies 2-4; see also Li & Chan, 2008) and when using an objective measure of behavior (see also Penseau et al., 2013) and past behavior (Study 3). Relatedly we also support previous research in showing goal effects in both between-subjects (Penseau et al., 2010) and within-subjects (Penseau et al., 2013)

designs. Fourth, we directly compared goal priority and goal conflict, with data across all four studies pointing to the stronger moderating effects of the former. Fifth, in addition to showing these effects for the previously studied behavior of physical activity (Studies 1-3; Li & Chan, 2008; Penseu et al., 2010, 2011, 2013) we showed the effects are similar for a broader range of health protective and risk behaviors (Study 4). Sixth, in contrast to Li and Chan (2008), we show that both goal priority and conflict (as moderators of the intention-behavior relationship) mediate the power of intention stability to moderate the intention-behavior relationship (Study 1). This supports the value of targeting these goal constructs as opposed to targeting intention stability as a means to increase the power of intentions to predict behavior.

The present work provides consistent evidence that goal priority is an important component of a strong intention that shows good predictions of health behavior. Nevertheless the nature of the effect does not directly support the value of simply targeting goal priority as a means to change behavior. Rather the data support the idea that increasing goal priority will increase health behavior among those with intentions to engage in the behavior. Thus targeting both increases in intention and goal priority may be necessary to increase health behavior.

The present research does not directly identify the mechanism underlying the effects for goal priority, although the results from Study 1 suggest its effects are not through impacts on intention stability. Goal priority may result in greater efforts to achieve that goal or greater persistence in the face of obstacles, although such potential mechanisms need direct testing. The lack of moderation effects for goal conflict observed here may be attributable to a number of factors (e.g., such as accuracy of such judgments) although this also awaits further research.

The current research has a number of strengths including demonstrating similar effects across four studies that varied in design, population, focal health behavior and whether past behavior was controlled or not. Nevertheless there are also a number of weaknesses. These include the fact that several studies relied on student samples, only Study 3 included an

objective measure of behavior, and that no study manipulated both goal intention and goal priority (or conflict). Future studies could usefully address these issues by manipulating both intention and goal priority and objectively measuring both past and future behavior across a range of health behaviors. It is also the case that the manipulations of goal priority and conflict we tested may not be the strongest. Although Study 2 showed that the manipulation of goal priority significantly changed this construct compared to the control condition, it was not significantly different from the goal conflict condition. In addition, Study 2 did not find evidence that the goal conflict manipulation significantly changed this construct compared to either the control or goal priority conditions.

Further studies using different manipulations of both goal constructs and testing their impacts on intention-behavior relationships are clearly warranted. The observed lack of effects for goal conflict parallel those reported by Penseau et al. (2010). However, the present research did not test goal facilitation which Penseau and colleagues show to directly predict behavior (Penseau et al., 2010, 2013) but not moderate the intention-behavior relationship (Penseau et al., 2010). Future research might usefully directly compare how goal priority and goal facilitation directly impact on behavior and moderate the intention-behavior relationships.

In conclusion the present research points to the importance of goal priority but not goal conflict as a key moderator of the intention-behavior relationship that helps take account of the potentially complex and idiosyncratic relationship between goals. Adding the goal priority construct to various models applied to health behaviors that posit intention as the key proximal determinant of behavior (e.g., theory of planned behavior, Ajzen, 1991; protection motivation theory, Maddux & Rogers, 1983; social cognitive theory, Bandura, 2001) may help counter the criticism that these models fail to consider the important relationship between focal behaviors and other competing or facilitating goals. Further research testing the impact of interventions to change both goal priority and goal intention in order to change health behavior are worthwhile.

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Table 1.

Multiple Regressions Predicting Self-reported Behavior for Study 1 (N = 237).

		B	SE	β
Step 1:	Intention	.325	.020	.719***
	Intention stability	.070	.043	.075
	Intention Stability x Intention	.047	.020	.107*
Step 2a:	Intention	.390	.035	.862***
	Intention stability	.021	.046	.022
	Intention Stability x Intention	.030	.021	.068
	Goal Priority	-.073	.043	-.123
	Goal Priority x Intention	.052	.018	.154**
Step 2b:	Intention	.298	.025	.657***
	Intention stability	.033	.043	.035
	Intention Stability x Intention	.033	.020	.076
	Goal Conflict	-.077	.027	-.146**
	Goal Conflict x Intention	-.028	.013	-.095*
Step 3:	Intention	.347	.037	.768***
	Intention stability	.004	.045	.004
	Intention Stability x Intention	.026	.021	.060
	Goal Priority	-.067	.044	-.112
	Goal Priority x Intention	.042	.020	.124*
	Goal Conflict	-.081	.027	-.154**
	Goal Conflict x Intention	-.014	.014	-.047

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2.

Multiple Regressions Predicting Self-Reported Behavior for Study 2.

	Control Condition (N = 50)			Goal Priority Condition (N = 59)			Goal Conflict Condition (N = 46)		
	B	SE	β	B	SE	β	B	SE	β
Step 1: Intention	.342	.047	.724***	.480	.040	.842***	.413	.061	.708***
Step 2: Intention	.074	.036	.156*	.333	.057	.583***	.145	.059	.249*
Past Behavior	.706	.066	.812***	.383	.112	.341***	.724	.108	.680***

* $p < .05$, ** $p < .01$, *** $p < .001$. Control condition, step 1: $\Delta R^2 = .524$, $\Delta F(1,49) = 53.92$, $p < .001$, step 2: $\Delta R^2 = .337$, $\Delta F(1,48) = 116.13$, $p < .001$; Goal Priority condition, step 1: $\Delta R^2 = .708$, $\Delta F(1,58) = 140.87$, $p < .001$, step 2: $\Delta R^2 = .049$, $\Delta F(1,57) = 11.64$, $p < .001$; Goal Conflict condition, step 1: $\Delta R^2 = .502$, $\Delta F(1,45) = 45.33$, $p < .001$, step 2: $\Delta R^2 = .251$, $\Delta F(1,44) = 44.86$, $p < .001$.

Table 3.

Hierarchical Multi-Level Regressions Predicting Objective Activity (Moderate and Vigorous METs) for Study 3.

Predictors	Control Condition			Goal Priority Condition			Goal Conflict Condition		
	B	SE	Beta	B	SE	Beta	B	SE	Beta
Intercept (γ_{00})	737.405	33.641		788.378	43.637		797.275	25.927	
Baseline M/V METs (γ_{01})	0.808	0.189	.375***	0.840	0.230	.533**	0.881	0.173	.459***
Baseline Non-Sedentary BI (γ_{02})	-0.059	51.693	.000	22.232	39.443	.072	-45.422	19.186	-.142*
Baseline Activity BI (γ_{03})	-20.798	15.981	-.072	-4.331	32.062	-.019	-16.351	9.185	-.084
Non-Sedentary Intentions (γ_{10})	20.684	27.087	.091	-18.442	19.801	.089	12.617	11.557	.055
Activity Intentions (γ_{20})	9.493	18.219	.046	47.618	13.833	.258**	7.799	17.794	.044

Control condition (19 participants, 250 data points): Intercept only model at Step 0, $-2LL = -1786.9$; Step 1, $-2LL = -1762.8$, $\chi^2(5) = 24.1$, $p < .001$. Goal priority condition (18 participants, 231 data points): Intercept only model at Step 0, $-2LL = -1641.1$; Step 1, $-2LL = -1611.1$, $\chi^2(5) = 30.0$, $p < .001$. Goal conflict condition (17 participants, 230 data points): Intercept only model at Step 0, $-2LL = -1656.3$; Step 1, $-2LL = -1631.5$, $\chi^2(5) = 24.8$, $p < .001$.

Table 4.

Hierarchical Multi-Level Regressions Predicting Self-Reported Behavior (Bernoulli Model) for Study 4 (N of participants = 348; N of observations = 3946).

Predictors	B	SE	Odds Ratio	95%CI
Step 1				
Intercept (γ_{00})	0.386	.064		
Intentions (γ_{10})	0.282	.024	1.326***	1.265— 1.389
Past Behavior (γ_{20})	2.483	.093	11.980***	9.977—14.385
Goal Priority (γ_{30})	0.071	.021	1.074***	1.030— 1.120
Step 2				
Intercept (γ_{00})	0.380	.045		
Intentions (γ_{10})	0.293	.024	1.340***	1.279— 1.404
Past Behavior (γ_{20})	2.381	.088	10.816***	9.090—12.869
Goal Priority (γ_{30})	0.085	.020	1.089***	1.047— 1.133
Goal Priority x Intentions (γ_{40})	0.022	.007	1.022***	1.009— 1.036

* $p < .05$; ** $p < .01$; *** $p < .001$. Note. B = unstandardized coefficient. Intercept only model at Step 0, $-2LL = -5565.7$; Step 1, $-2LL = -4893.4$, $\chi^2(3) = 672.3$, $p < .001$; Step 2, $-2LL = -4848.7$, $\chi^2(1) = 44.7$, $p < .001$.