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Nothing Will Stop Me? Flexibly Tenacious Goal Striving With Implementation Intentions

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Implementation intentions (if-then plans) help people to automatically perform goal-directed behaviors when they encounter goal-relevant critical situations. Besides the intended beneficial effects on goal attainment, however, goal-directed behaviors might entail various costs. Successful goal striving then requires flexible tenacity: tenaciously holding on to behaviors that inflict bearable costs but flexibly backing off from performing excessively costly behaviors. In the present research, we investigated whether goal striving with implementation intentions is characterized by such flexible tenacity. In Experiments 1 and 2, implementation intention participants held on to goal-directed behaviors that inflicted bearable costs (sustaining unpleasant noise and annoying effort), whereas participants with mere goal intentions reduced their performance of goal-directed behaviors. In Experiment 3, both goal and implementation intention participants backed off from performing an excessively costly behavior (involving monetary loss). This effect was more pronounced among implementation intention participants, who additionally lowered their goal commitment. We conclude that implementation intentions render goal striving tenaciously flexible, facilitating goal-directed behaviors unless this is associated with excessive costs.

Keywords: implementation intentions, goal striving, flexibility, tenacity, cost and punishment

People often struggle with attaining their behavioral goals even though intentions might be quite strong (e.g., failing to go jogging when the goal is to stay fit; Sheeran, 2002). Gollwitzer (1999, 2014) therefore suggests furnishing goals with implementation intentions—specific plans in which a critical situation and a goal-directed behavior are linked together in an if-then format: "If I come home in the evenings, then I will go jogging!" Numerous empirical studies have demonstrated that forming this strategy increases the rates of goal attainment in a variety of domains (e.g., health, academic, and interpersonal; Adriaanse, Vinkers, De Ridder, Hox, & De Wit, 2011; Bélanger-Gravel, Godin, & Amireault, 2013; Gollwitzer & Sheeran, 2006; Hagger & Luszczynska, 2014). Besides facilitating goal attainment, however, performing goal-directed behaviors might entail various costs as well. Some costs might be unpleasant or annoying (e.g., jogging despite bad weather or still feeling sore from the last run) and others disproportionate

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(e.g., leaving urgent work projects unfinished or missing out on important social events).

Successful goal striving thus requires *flexible tenacity* (Brandtstädter & Rothermund, 2002; Gollwitzer, Parks-Stamm, Jaudas, & Sheeran, 2008). People should tenaciously perform goal-directed behaviors that inflict bearable costs, rather than offhandedly abandoning their goals, but they should think twice about holding on to behaviors that are excessively costly and instead flexibly back off (Klinger, 1975; Wrosch, Scheier, Carver, & Schulz, 2003). In the present research, we investigate the specific conditions under which people hold on to goal-directed behaviors or back off, respectively, after having formed implementation intentions.

How Do Implementation Intentions Work?

The pervasive effects of implementation intentions on goal attainment pertain to two distinct cognitive mechanisms (Gollwitzer, 1999; Webb & Sheeran, 2007). First, the situation specified in the if-part becomes mentally activated and is thus easily accessible and recognizable (Aarts, Dijksterhuis, & Midden, 1999; Achtziger, Bayer, & Gollwitzer, 2012; Janczyk, Dambacher, Bieleke, & Gollwitzer, 2015; Parks-Stamm, Gollwitzer, & Oettingen, 2007; Wieber & Sassenberg, 2006). Second, implementation intentions forge a strong mental link between this situation and the goal-directed behavior specified in the then-part, so that the behavior can be automatically initiated (Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009; Brandstätter, Lengfelder, & Gollwitzer, 2001; Gollwitzer & Brandstätter, 1997). Forming implementation intentions thus allows people to turn the control of their behavior from a top-down (i.e., intentionally controlled) to a bottom-up (i.e., stimulus-controlled) process (Gilbert, Gollwitzer, Cohen, Oettingen, & Burgess, 2009; Webb & Sheeran, 2007). But what are the consequences of bottom-up behavior regulation for goal striving in terms of flexible tenacity? Specifically, to what extent do people stay in control over their goal striving after having formed implementation intentions?

Goal Striving With Implementation Intentions: Both Flexible and Tenacious

The literature suggests that goal striving with implementation intentions can bear characteristics of both flexibility and tenacity. First, one stream of research has focused on the goal-dependency of implementation intention effects (Gollwitzer & Schaal, 1998), setting out from the assumption that goals exert influence even on highly automatic behaviors (Aarts & Dijksterhuis, 2000; Bargh, 1989). Specifically, implementation intentions are effective only when a corresponding goal had been activated (Sheeran, Webb, & Gollwitzer, 2005) and when commitment to this goal is sufficiently strong (Orbell, Hodgkins, & Sheeran, 1997; Sheeran et al., 2005). Goal striving with implementation intentions can thus be flexible because it rests on a goal-dependent form of automaticity (Gollwitzer, Fujita, & Oettingen, 2004). A second stream of research has focused on the consequences of forming implementation intentions when nonplanned opportunities for goal attainment emerge. This has revealed that people devalue such alternative opportunities (Bayuk, Janiszewski, & Leboeuf, 2010) and are less likely to seize them (Masicampo & Baumeister, 2012; Parks-Stamm et al., 2007). This suggests that the effects of implementation intentions can bear characteristics of tenacity because the planned behavior takes properties of "instant habits" (Gollwitzer, 1999, 2014).

Another perspective on the flexible and tenacious characteristics of goal striving with implementation intentions can be derived from motivational intensity theory (Brehm & Self, 1989; Richter, Gendolla, & Wright, 2016). It posits that people increase effort according to perceived task difficulty as long as successful performance seems possible and justified, but back off from investing effort otherwise. Two predictions can be derived from this theory with regard to implementation intentions. First, because implementation intentions automate behavior, their formation should reduce the effort required for performing a task, thereby facilitating performance as long as success is possible and justified. In line with this hypothesis, it has been observed that implementation intention participants continue to invest effort as task difficulty increases, whereas participants with a mere performance goal disengage from difficult tasks (Freydefont, Gollwitzer, & Oettingen, 2016). The second prediction is that even implementation intention participants should back off from investing effort when successful performance becomes unlikely or unjustified, al-

though this might occur for excessively difficult tasks only.

In sum, prior research suggests that implementation intentions can bear characteristics of both tenacious and flexible goal striving. However, specific conditions under which flexibility versus tenacity prevails in goal striving with implementation intentions have yet to be explored. In the present research, we focus on how various costs of performing goal-directed behaviors tip the balance in one or the other direction, thus creating flexibly tenacious goal-striving.

Focusing on the Costs of Performing Goal-Directed Behaviors

In order to establish bearable versus excessive costs of performing goal-directed behaviors, we turned to research on human learning and behavior change by punishment. Punishment is a procedure that decreases the probability of performing a behavior by establishing negative consequences (costs) contingent on the performance of the behavior (Azrin & Holz, 1966; Johnston, 1972). Although it is difficult to determine a priori how aversive a punishment is, there are different forms of punishment that arguably differ in their associated costs (e.g., Martin & Pear, 2016; Pierce & Cheney, 2004). Specifically, more (vs. less) aversive punishment is known to reduce behavior execution at a much faster rate and more completely (Church, Raymond, & Beauchamp, 1967; Karsh, 1962, 1964).

To establish bearable costs, we relied on noise and effort in Experiments 1 and 2, respectively. These two forms of punishment are commonly perceived as unpleasant and annoying; they thus reduce the frequency of behaviors rather gradually and without completely abolishing them (e.g., Elsmore, 1971; Holz & Azrin, 1962). In order to establish excessive costs, we instead relied on monetary losses as punishment in Experiment 3. Money provides access to a variety of goods and services, and it allows people to attain various goals (Lea & Webley, 2006; Vohs & Baumeister, 2011). People are thus strongly motivated by monetary incentives and they particularly try to avoid losing it (Kahneman & Tversky, 1984). Accordingly, punishing behaviors with real or symbolic monetary losses abolishes their execution almost immediately and completely (e.g., Crosbie, 1990; Weiner, 1962).

The Present Research

Goal striving with implementation intentions is known to be characterized by both flexibility (e.g., Sheeran et al., 2005) and tenacity (e.g., Parks-Stamm et al., 2007). In terms of motivational intensity theory (Brehm & Self, 1989; Richter et al., 2016), forming implementation intentions should reduce the effort required for performing a task. This should in turn result in tenacious goal striving: People keep investing effort because even difficult tasks are subjectively less demanding and justify expenditure of effort. Nevertheless, people with implementation intentions should back off from investing effort when successful performance becomes unlikely or unjustified and flexibly disengage from their goal. Applied to the costs of performing goal-directed behaviors, this suggests that individuals should tenaciously persist as long as costs are bearable, but flexibly back off when costs become excessive. The present experiments address the question of whether goal striving with implementation intentions is characterized by such flexible tenacity. We expected implementation intention participants to tenaciously hold on to goal-directed behaviors associated with bearable costs in Experiments 1 and 2, but to flexibly back off from behaviors inflicting excessive costs in Experiment 3.

In all three experiments, we followed the approach taken in previous research (Gollwitzer & Sheeran, 2006) and compared the effects of forming implementation intentions to the effects of forming mere goal intentions (i.e., "I intend to do X"; Triandis, 1977). While implementation intentions constitute a bottom-up form of regulation that automates action control (Gilbert et al., 2009; Gollwitzer & Sheeran, 2006), goal intentions are a top-down form of behavior regulation (Wieber, Sezer, & Gollwitzer, 2014). Accordingly, forming implementation intentions should reduce the required effort for performing goal-directed behaviors relative to goal intentions. We therefore expected implementation intentions to render behavior more tenacious than goal intentions in Experiments 1 and 2, in which the costs of performing goal-directed behaviors were bearable. In Experiment 3, however, we expected people with im-

plementation intentions to back off from performing goal-directed behaviors that inflict excessive costs.

General Methods

Card-Matching Task

We developed a computerized card-matching task (see Figure 1), programmed using E-Prime 2.0 (Psychology Software Tools, Pittsburgh, PA) and presented on a 34.50 cm × 19.40 cm screen. In each trial of this task, participants first saw a fixation cross for 750 to 1,250 milliseconds (ms), which was then replaced by a green, yellow, blue, or red comparison card presented for 1,000 ms. Afterward, a matching set appeared on the screen, comprising two cards of congruent color (i.e., same color as the comparison card) and two cards of incongruent color (i.e., different color than the comparison card). The colors of all cards and the order of the matching set were counterbalanced. Participants' task was to select one of the congruent cards by pressing the corresponding key on a response box *as quickly as possible*, and they were free in choosing which one.

However, one of the two congruent cards appeared 150 ms earlier than the remaining cards from the matching set. We refer to this card as the *critical card*, in contrast to *the noncritical card* that appeared together with the two incongruent cards, because it was best suited to attain the goal of responding as quickly as possible. Holding on to the goal and implementation intentions thus required choosing the critical over the noncritical card. Importantly,

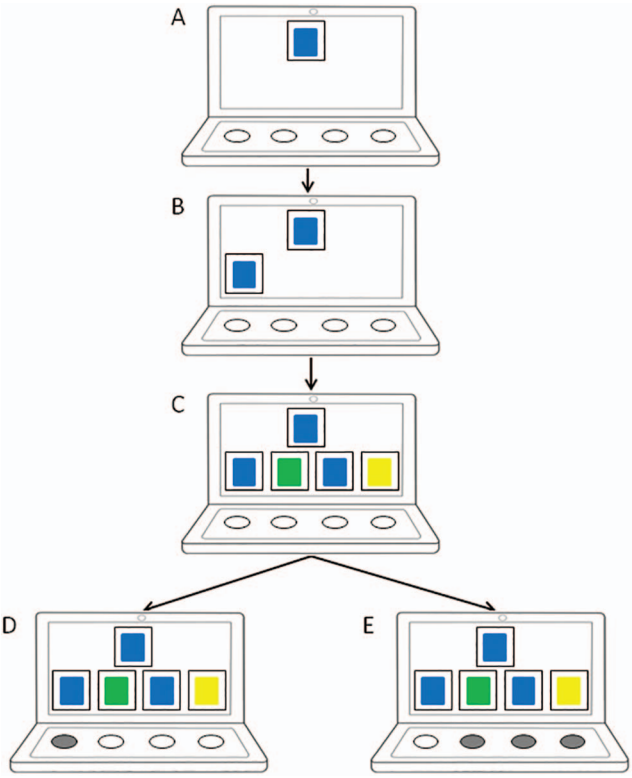

Figure 1. The card-matching task started with the presentation of comparison card (A). Next, the critical congruent card appeared (B), followed by the remaining three cards of the matching set, comprising the noncritical congruent and two incongruent cards (C). Participants could choose either the critical card (D) and receive punishment, or any of the other cards from the matching set (E). See the online article for the color version of this figure.

however, we punished each critical card choice. This setup allowed us to test whether participants would hold on to their goal and implementation intentions, performing goal-directed behaviors that inflicted various costs, either bearable or excessive.

Data Analysis

We analyzed our data with the statistical software R version 3.3.0 (R Core Team, 2016). Trials with incongruent card choices were disregarded (e.g., choosing a green card when the comparison card was red; 1.1% to 2.0% of the data). The remaining choice data (1 = critical card, 0 = noncritical card) were analyzed with generalized linear mixed-effects models (GLMMs) implemented in the lme4 package (Bates, Mächler, Bolker, & Walker, 2015). These models allow researchers to simultaneously estimate fixed (i.e., experimental factors) and random effects (i.e., participants) without requiring data aggregation, thus achieving both high statistical power and robustness to imbalanced data (e.g., resulting from removing outliers or erroneous responses) compared to other methods (e.g., OLS regression, ANOVA). We report the two main outputs of our GLMM estimations: (1) the decomposition of fixed-effect contributions for evaluating main and interaction effects of the full-factorial (i.e., completely crossed) model, and (2) fixed-effects of the explanatory variables to test specific contrasts.[1] Note that these two outputs result from a single GLMM analysis.

Experiment 1: White Noise

In Experiment 1, we investigated the effects of associating goal-directed behavior with bearable costs, punishing each critical card choice with the administration of white noise. We assessed how frequently participants with an implementation intention selected the critical over the noncritical card in our card-matching task, compared to participants with a goal intention. We expected implementation intention participants to tenaciously perform the goal-directed behavior despite the punishment, as evidenced by a stable frequency of critical card choices. In contrast, we expected a decrease in this frequency among goal intention participants.

Method

Participants. Forty right-handed female university students voluntary participated in the study (age: $M = 21.8$, $SD = 3.4$) and were randomly assigned to either the goal intention or the implementation intention condition. In this and the following experiments, all participants were female because the university where the study was conducted has few male students.

Materials. Participants worked on 64 trials of the card-matching task described in the General Methods section with two variations. First, the cards depicted one or two geometric symbols (circles, squares, crosses, or triangles) that were, however, not task-relevant. Second, the task trials were intermixed with 64 filler trials in which we presented all cards from the matching set simultaneously. The matching set comprised either one or two congruent cards but their selection was never punished. Because these trials comprised neither a goal-directed behavior nor punishment, we disregarded them in our analyses.

Procedure. Upon their arrival in the lab, we introduced all participants to the task. They were informed that a green, yellow, blue, or red comparison card would appear at the top of the screen, followed by a matching set of four cards at the bottom of the screen. We instructed them to choose a congruent card matching the color of the comparison card by pressing the corresponding key *as quickly as possible*. Finally, we asked them to wear headphones throughout the study and informed them about the occasional presentation of white noise. Participants then completed 10 practice trials without punishment to become familiar with the task.

Implementation and goal intentions. After performing the practice trials, we instructed half of the participants to adopt the following implementation intention (Gollwitzer, 1999): "If I see a card with the same color as the card at the top

[1] While the statistical significance of GLMM fixed-effects can be readily assessed, there is yet no established way to calculate the denominator degrees of freedom (df_d) for evaluating the significance of F statistics in the decomposition of fixed-effect contributions. However, with a sufficient number of participants and observations F statistics effectively approximate a normalized χ^2 distribution with well-known degrees of freedom (i.e., $F(df_n, df_d) \rightarrow \chi^2(df_n)/df_n$). We therefore report the χ^2 statistics along with their associated degrees of freedom and p values.

of the screen, then I will press the corresponding key as quickly as possible!" and the other half to adopt the following goal intention (Triandis, 1977): "I intend to choose a correct card as quickly as possible!" Participants were subsequently requested to learn and verbally repeat their goal or implementation intention three times to facilitate proper encoding of the information.

Card matching task. Participants proceeded with working on the card matching task. Upon choosing a card by pressing the corresponding key, participants were presented with a 2,000 ms blank screen. In case participants had chosen the critical card, we administered white noise (generated from a uniform probability distribution at 48 kHz) via headphones. After noncritical card choices, participants saw the blank screen without white noise administration. The next trial started after another 500 ms blank screen.

Noise rating. At the end of the card-matching task, we assessed the perceived unpleasantness of the white noise with a single item: "How pleasant/unpleasant was the noise?" on a 7-point Likert scale ranging from 1 = *entirely pleasant* to 7 = *entirely unpleasant*. Participants were then thanked for their participation and debriefed.

Results

Noise rating. A *t* test revealed virtually no differences on the perceived unpleasantness of the white noise between the goal ($M = 5.70$, $SD = 1.30$) and implementation intention conditions ($M = 5.70$, $SD = 1.08$), $t(38) = 0$, $p = 1$, $d = 0$. The ratings were significantly above the center of the scale in both conditions, $t(19) = 5.84$, $p < .001$, $d = 1.34$, and $t(19) = 7.03$, $p < .001$, $d = 1.61$, respectively, suggesting that the white noise was perceived as unpleasant.

Card choices. The full-factorial analysis revealed a significant main effect of Trial,[2] $\chi^2(1) = 18.04$, $p < .001$, that was further qualified by an interaction effect of Trial and Condition, $\chi^2(1) = 4.86$, $p = .027$. To follow up this interaction effect, we determined the fixed-effects of Trial in both conditions (see Table 1). In line with our hypothesis, we observed a significant and negative effect of Trial in the goal intention condition, $\beta = -1.14$, $OR = 0.32$, $SE = 0.25$, $z = 4.59$, $p < .001$, indicating that participants became less likely to choose the critical card over time (first quarter of trials: $M = 73.6\%$, $SD = 19.6\%$, last quarter of trials: $M = 60.2\%$, $SD = 33.4\%$). No such effect evinced in the implementation intention condition, $\beta = -0.35$, $OR = .70$, $SE = 0.26$, $z = 1.36$, $p = .174$, indicating that the critical card was chosen with rather consistent probability over time (first quarter of trials: $M = 72.4\%$, $SD = 18.8\%$, last quarter of trials: $M = 70.0\%$, $SD = 35.4\%$). This pattern of results is illustrated in Figure 2.

Discussion

In Study 1 we investigated how forming implementation versus goal intentions affects the likelihood of performing a goal-directed behavior (i.e., choosing the critical card) when its execution is associated with bearable costs (i.e., white noise). In line with our hypothesis, we found that implementation intention participants remained similarly likely to perform the behavior throughout the experiment, while goal intention participants became significantly less likely to perform the behavior. Importantly, this finding could not be explained by differences in how unpleasant the white noise was perceived by participants in the two conditions. Study 1 thus provides evidence that implementation intentions render goal-directed behaviors tenacious when their costs are bearable.

One might argue that our findings merely reflect that goal intentions became less effective over time, while implementation intentions remained equally effective. If this was true, the observed pattern of results would not reflect differential responding to the costs of goal-directed behaviors and could accordingly not be considered as corroborating our hypothesis. To rule out this alternative explanation, we compared goal and implementation intention effects with and without punishment in Experiment 2: if the costs of performing goal-directed behav-

[2] We scaled the Trial variable to the interval [0,1] prior to all analyses. While this does not affect the pattern of results or significances, it considerably enhances GLMM estimation and the interpretability of the fixed-effects. For instance, the *OR*s of the Trial effects reported in Experiment 1 reflect how much greater (or smaller) the odds for choosing a critical card were at the end of the experiment compared to the beginning.

Table 1
Fixed-Effects in Experiments 1 to 3. Intercepts Represent the Predicted Odds Ratio of Choosing the Critical Over the Noncritical Card for Participants in Implementation Intention Conditions With Punishment

Effect	Experiment 1				Experiment 2				Experiment 3			
	β	*OR*	*SE*	|*z*|	β	*OR*	*SE*	|*z*|	β	*OR*	*SE*	|*z*|
Intercept	1.36	3.89	.35	3.85***	1.39	4.00	.33	4.12***	2.10	8.18	.35	6.05***
Trial	−.35	.71	.26	1.36	.40	1.49	.17	2.42*	−4.13	.02	.17	24.61***
Condition = Control	.17	1.18	.50	.34	.31	1.36	.31	.65	−1.35	.26	.49	2.74**
Trial × Condition	−.79	.45	.36	2.21*	−1.22	.30	.23	5.21***	2.30	9.97	.22	10.65***
Punishment = No					.62	1.85	.48	1.30	.16	1.17	.49	.32
Trial × Punishment					−.44	.64	.24	1.84†	4.35	77.47	.23	18.91***
Condition × Punishment					−.67	.51	.68	.98	1.44	4.21	.70	2.06*
Trial × Condition × Punishment					1.45	4.28	.34	4.29***	−2.46	.09	.31	7.92***

Note. Trial was rescaled in all analyses to the interval [0,1] to enhance model estimation and the interpretability of the coefficients. This did not affect the patterns of results and significances.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

iors rather than the decay of effectiveness governed the results of Experiment 1, no differences between goal and implementation intentions should evince in the absence of punishment. In addition to this, we made three changes to enhance the generalizability of our results. First, we doubled the number of trials to check whether implementation intention participants would continue performing goal-directed behaviors even when facing costs over an extended period of time. Second, we turned to a different form of punishment that involved effort rather than unpleasant noise. Third, we increased the number of participants to increase

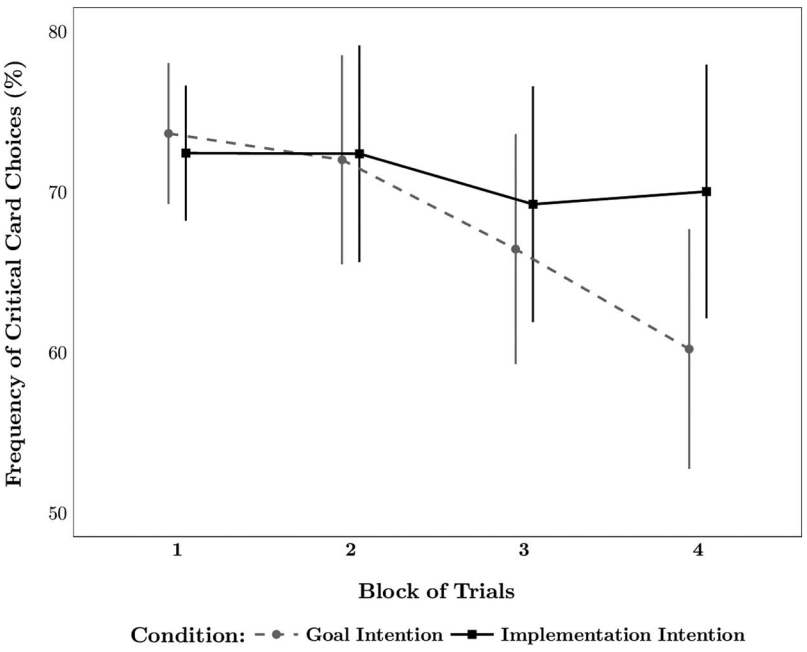

Figure 2. Critical choices as a function of Trial (averaged into four blocks for plotting) and Condition in Experiment 1. Error bars represent standard errors of the mean.

statistical power for detecting changes in choice behavior.

Experiment 2: Effort

The purpose of Experiment 2 was manifold. First and foremost, we wanted to replicate the main finding of Experiment 1 that implementation intentions, but not goal intentions, are resistant to bearable costs of performing goal-directed behaviors. The second aim was to rule out differential decay regarding the effectiveness of goal versus implementation intentions as an alternative explanation of this observation. We therefore added two control conditions in which participants received implementation and goal intentions, respectively, but critical card choices were never punished. If we interpret the findings of Experiment 1 correctly, no differences between goal and implementation intentions should emerge in these no-punishment conditions. Finally, we also aimed to generalize our observations to a different form of punishment as well as a larger number of punishments. We did this by replacing the administration of white noise upon performing the goal-directed behavior with a requirement to press all response buttons multiple times before proceeding with the experiment (i.e., effort). Moreover, we used twice as many trials as in Experiment 1 (i.e., 128), thus increasing the total duration of the experiment and the number of punishments potentially experienced by our participants.

Method

Participants. One hundred right-handed women participated in the study (age: $M = 20.0$, $SD = 3.7$). We randomly assigned them to one of the four conditions resulting from a 2-between (goal intention vs. implementation intention) $\times$ 2-between (punishment vs. no punishment) factorial design. Two participants did not understand that two cards matched the color of the comparison card and consequently tried to identify the one card that matched the comparison card best. In the no-punishment conditions, two participants reported and seemed to have chosen noncritical cards on purpose. We excluded these four participants from the analyses, resulting in an effective sample size of 96 participants.

Materials and procedure. The materials remained the same as in Experiment 1 except that we used plain colored cards without task-irrelevant geometric figures. The procedure also closely resembled that of Experiment 1 with two exceptions. First and foremost, we used a different protocol for administering punishment: The word "press" appeared upon choosing the critical card and remained on the screen until participants had pressed the four response keys 10 to 30 times in a row (the actual number of required presses was randomly determined). Participants in the no-punishment conditions instead saw a 2,000 ms blank screen after each card choice. Second, we increased the number of practice trials to 15, and the number of task trials to 128, which were interrupted by 10 s breaks after each block of 32 trials. After participants had finished working on the task, we assessed the perceived unpleasantness of the punishment (i.e., the effortful task assignment). Unfortunately, these data were not saved due to software issues and could thus not be analyzed.

Results

Card choices. The full-factorial analysis revealed a significant interaction effect of Trial and Condition, $\chi^2(1) = 9.55$, $p = .002$, which was further qualified by a three-way interaction effect of Trial, Condition, and Punishment, $\chi^2(1) = 18.29$, $p < .001$. No other effect reached significance, $\chi^2(1)$s < 3.10, ps $> .080$. We further scrutinized the significant findings by investigating corresponding fixed-effects (see Table 1). In the punishment conditions, goal intention participants became significantly less likely to choose the critical card over the course of the experiment, $\beta = -0.82$, $OR = 0.44$, $SE = 0.16$, $z = 4.96$, $p < .001$ (first quarter of trials: $M = 73.4\%$, $SD = 23.7\%$, last quarter of trials: $M = 63.4\%$, $SD = 36.5\%$), whereas implementation intention participants became even more likely to choose the critical card, $\beta = 0.40$, $OR = 1.49$, $SE = 0.17$, $z = 2.42$, $p = .015$ (first quarter of trials: $M = 73.8\%$, $SD = 17.0\%$, last quarter of trials: $M = 76.6\%$, $SD = 29.3\%$). This difference between the goal and the implementation intention conditions was significant, $\beta = 1.22$, $OR = 3.38$, $SE = 0.23$, $z = 5.21$, $p < .001$. Not surprisingly, we observed no such effects in the no-punishment conditions (ps $> .30$). Figure 3 summarizes this pattern of results.

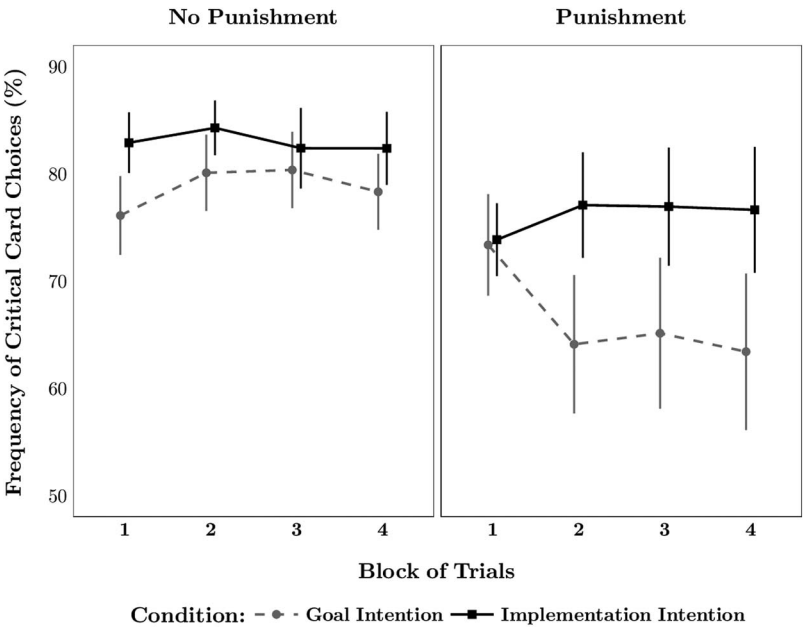

Figure 3. Critical choices as a function of Punishment, Trial (averaged into four blocks for plotting), and Condition in Experiment 2. Error bars represent standard errors of the mean.

Discussion

In Experiment 2, we investigated how forming implementation versus goal intentions affects the likelihood of performing a goal-directed behavior (i.e., choosing the critical card) when doing so is punished by an effort task (i.e., repeatedly hitting response buttons). Replicating the results from Experiment 1, we observed that implementation intention participants became even more likely to perform the goal-directed behavior over the course of the experiment, while goal intention participants became significantly less likely to do so. Considered jointly, the results of Experiments 1 and 2 corroborate our hypothesis that forming implementation intentions renders goal-directed behavior tenacious toward bearable costs. Moreover, we observed this predicted tenacity across two different punishments and over substantial periods of time with a potentially large number of punishments (up to 128 trials).

Notably, we found no difference between goal and implementation intentions in the absence of punishment. Participants in the no-punishment conditions maintained a similarly high frequency of performing the goal-directed behavior, irrespective of whether they had formed goal or implementation intentions. This result is incompatible with the assumption that goal intentions merely become less effective over time, while implementation intentions stay equally effective, thus strengthening our interpretation in terms of tenacity. On a cautionary note, however, one might argue that the mere presence of punishment might already tax cognitive resources, requiring participants to process additional information (e.g., discovering which responses are punished) and/or to engage in an additional task (e.g., hitting response buttons). This might disproportionately derail the effectiveness of goal intentions, which lack the resource-independent, bottom-up automaticity engendered by forming implementation intentions (Gilbert et al., 2009; Gollwitzer & Sheeran, 2006). We addressed this issue in Experiment 3.

Finally, Experiments 1 and 2 so far demonstrated that forming implementation intentions supports people in holding up goal-directed behaviors associated with bearable costs. This finding is well in line with our hypotheses. But a central question remains: What happens when

performing goal-directed behaviors inflicts disproportionate costs, potentially jeopardizing the attainment of other important goals? Successful goal striving requires to flexibly back off. In Experiment 3, we examined whether people retain this flexibility after having formed implementation intentions.

Experiment 3: Monetary Costs

The primary aim of Experiment 3 was to test whether people with implementation intentions back off from showing goal-directed behaviors that are associated with excessive costs. We therefore punished goal-directed behavior by inflicting monetary loss. We expected implementation intention participants to back off from performing goal-directed behaviors. As in our previous experiments, we expected goal intention participants to disengage from the goal-directed behavior as well.

A second aim of Experiment 3 was to investigate whether the mere presence of punishment already causes a decline of goal-directed behavior in the goal intention condition, as cognitive resources required for goal striving with goal intentions might be taxed. To achieve this, we established a total of four conditions and always punished participants' choices, holding constant the presence of punishment. However, performing the critical goal-directed and the noncritical alternative behaviors resulted in the same monetary loss in two of these conditions (i.e., equal punishment), while we inflicted a greater monetary loss on performing the critical goal-directed rather than the noncritical alternative behavior in the remaining two conditions (i.e., different punishment). Crucially, the equal-punishment conditions resembled the no-punishment conditions in Experiment 2 in that critical and noncritical responses had the same consequences, and are thus interpreted in the same way as a control condition. On the other hand, punishing critical card choices more strongly than noncritical card choices allowed us to test whether people back off from engaging in excessively costly goal-directed behavior.

Method

Participants. One hundred right-handed women participated in the study ($M = 20.5$, $SD = 3.0$) and were randomly assigned to one of the four conditions of a 2-between (Intention: goal intention vs. implementation intention) $\times$ 2-between (Punishment: different vs. equal) factorial design. Note that the differences in punishment were no longer absolute but relative (i.e., the goal-directed and alternative behaviors were punished differently or equally); we therefore refer to different versus equal punishment conditions. One participant reported to have chosen both the critical and the noncritical card on each trial by simultaneously pressing the two corresponding buttons and was therefore excluded from the analyses, resulting in an effective sample size of 99 participants.

Materials and procedure. The materials remained the same as reported previously. The procedure also closely resembled that of Experiments 1 and 2 with two exceptions. Most importantly, we once again used a different protocol for administering punishments. Participants received a starting balance of 1,000 points. The experimenter informed them that their final number of points would determine their chances to win one of five 100 Euro lottery prizes, and that more points would translate into a greater chance to win a prize. However, participants in the different-punishment conditions lost 5 points for choosing the critical card and 1 point for choosing the noncritical card. In the equal-punishment conditions, choosing either card resulted in a loss of 3 points. Importantly, we always deducted 9 points for incorrectly choosing incongruent cards (e.g., choosing a green card when the comparison card was blue) to discourage purposeful errors. Information about the points was displayed for 500 ms (e.g., "−5 points").

Second, we increased the number of practice trials to 20 and used a forced-choice paradigm to ensure that all participants would experience the consequences of their choices: the experimenter instructed participants to choose the critical, the noncritical, and the two incongruent cards five times each. Thus, at the end of the practice period, conditions were equivalent regarding the frequency of choice of each type of card. Third, we increased the number of task trials to 192, interrupted by a break of 10 seconds after half of the trials.

Questionnaires. It seems plausible that backing away from performing goal-directed behaviors is accompanied by changes in commitment to the corresponding goal (Kruglanski

et al., 2002; Shah & Kruglanski, 2002). We therefore assessed participants' goal commitment twice, once before they started working on the task and once again after they had completed it. We used two items in each assessment: "How strong is your intention [motivation] to choose a correct card as quickly as possible?" As in our previous experiments, we also assessed how unpleasant the monetary loss was rated by our participants, and, additionally, how strongly they were motivated to avoid it. We measured these aspects with two and four items, respectively: "How unpleasant was the loss of points [money]?" and "How strong was your intention [motivation] to lose as little points [money] as possible?" Participants answered our questions on 7-point Likert scales ranging from 1 = *not very strong* or *entirely pleasant* to 7 = *very strong* or *entirely unpleasant*. Altogether, we thus obtained four self-report variables: commitment to the focal goal both before and after the task, and posttask assessments of the perceived unpleasantness of the monetary losses as well as the motivation to avoid them.

Results

Goal commitment questionnaire. To investigate the effect of punishment on goal-commitment in our experimental conditions, we subjected posttask goal commitment to an ANCOVA with Condition (goal vs. implementation intention) and Punishment (different vs. equal) as between-participants factors and baseline commitment as covariate. To conduct such an analysis two important assumptions must be checked (e.g., Miller & Chapman, 2001): The covariate should not differ between groups and the relationship between the dependent variable and the covariate should be the same across groups. Accordingly, we first subjected baseline goal commitment ratings to an ANOVA with Condition (goal vs. implementation intention) and Punishment (different vs. equal) as between-participants factors. As it turned out, none of the observed effects reached significance, Fs < 1.65, ps $> .20$, $\eta_P^2 < 0.03$, indicating that baseline commitment did not differ between groups. To check the second assumption, we evaluated the three-way interaction effect of the covariate and the Condition × Punishment interaction effect (Howell, 2007). This effect was not significant either, $F(3, 91) = 1.27$, $p = .675$, $\eta_P^2 = 0.02$, suggesting a similar relationship between baseline and posttask commitment across groups. Taken together, the assumptions for running the ANCOVA analysis are properly met.

The ANCOVA revealed a significant main effect of Punishment, $F(1, 94) = 5.26$, $p = .024$, $\eta_P^2 = 0.05$, a marginally significant main effect of Condition, $F(1, 94) = 3.89$, $p = .051$, $\eta_P^2 = 0.04$, and a marginally significant interaction effect of Punishment and Condition, $F(1, 94) = 3.00$, $p = .086$, $\eta_P^2 = 0.03$. We followed these results up with a set of three orthogonal contrasts. Goal commitment after task completion was lower in different-punishment than equal-punishment conditions, $t(91) = 2.16$, $p = .034$, $d = 0.44$, explaining the significant main effect of Punishment. Implementation intention participants reported a significantly lower goal commitment after task completion than goal intention participants in the different-punishment condition ($M_{adj} = 5.80$, $SD_{\text{adj}} = 0.90$ vs. $M_{adj} = 6.48$, $SD_{\text{adj}} = 0.91$), $t(91) = 2.41$, $p = .018$, $d = 0.51$, while no such difference evinced in the equal-punishment condition ($M_{adj} = 6.54$, $SD_{\text{adj}} = 0.91$ vs. $M_{adj} = 6.58$, $SD_{\text{adj}} = 0.90$), $p = .939$, $d = 0.02$. Considered jointly, these results suggest that implementation intention participants lowered their commitment to the task goal when choosing the critical card was punished by a larger monetary loss than choosing the noncritical card, while goal intention participants maintained a similar level of commitment.

Punishment questionnaire. We subjected both the reported unpleasantness of the monetary losses and the reported motivation to avoid them to ANOVAs with Condition (goal vs. implementation intention) and Punishment (different vs. equal) as between-participants factors. We only found a marginally significant main effect of Punishment, $F(1, 95) = 3.75$, $p = .056$, $\eta_P^2 = 0.04$, indicating that participants in the different-punishment condition tended to perceive monetary losses as less unpleasant than participants in the equal-punishment condition. Importantly, no other effect approached significance, Fs < 1, ps $> .765$, η_P^2s < 0.01, suggesting that goal and implementation intention participants did not differ in their evaluation of the unpleasantness of the punishment.

Card choices. The full-factorial analysis revealed significant main effects of Trial, $\chi^2(1) = 325.54$, $p < .001$, and Punishment, $\chi^2(1) = 50.27$, $p < .001$. These were governed by significant two-way interaction effects of Trial and Punishment, $\chi^2(1) = 374.58$, $p < .001$, and of Trial and Condition, $\chi^2(1) = 26.62$, $p < .001$; the three-way interaction effect of Trial, Punishment, and Condition was significant as well, $\chi^2(1) = 62.43$, $p < .001$. The underlying pattern of results is depicted in Figure 4. We analyzed fixed-effects to further explore the main and interaction effects (see Table 1). In the different-punishment conditions, over time implementation intention participants became less likely to choose the critical card (first quarter of trials: $M = 72.1\%$, $SD = 29.7\%$, last quarter of trials: $M = 30.5\%$, $SD = 35.0\%$), $\beta = -4.13$, $OR = 0.02$, $SE = 0.17$, $z = 24.61$, $p < .001$. An effect in the same direction evinced in the goal intention condition as well (first quarter of trials: $M = 59.9\%$, $SD = 28.0\%$, last quarter of trials: $M = 39.0\%$, $SD = 36.5\%$), $\beta = -1.83$, $OR = 0.16$, $SE = 0.14$, $z = 13.39$, $p < .015$, albeit being significantly less pronounced, $\beta = 2.30$, $OR = 9.97$, $SE = 0.22$, $z = 10.65$, $p < .001$. In the equal-punishment condition, both implementation intention (first quarter of trials: $M = 85.0\%$, $SD = 13.2\%$, last quarter of trials: $M = 87.4\%$, $SD = 14.3\%$), $\beta = 0.22$, $OR = 1.25$, $SE = 0.16$, $z = 1.42$, $p = .155$, and goal intention participants (first quarter of trials: $M = 86.6\%$, $SD = 11.4\%$, last quarter of trials: $M = 87.2\%$, $SD = 13.5\%$), $\beta = 0.06$, $OR = 1.06$, $SE = 0.16$, $z = 0.38$, $p = .708$, remained similarly likely to choose the critical card, and did not differ significantly from each other, $\beta = -0.16$, $OR = 0.85$, $SE = 0.22$, $z = 0.74$, $p = .462$.

Discussion

In Experiment 3, we investigated how forming implementation versus goal intentions affects the likelihood of performing a goal-directed response (i.e., choosing the critical card) when its execution involves higher monetary losses than performing an alternative response. Both implementation and goal intention participants became significantly less likely to perform the goal-directed behavior over the course of the experiment. In line with our hypotheses, this finding suggests that people flexibly back off from performing goal-directed be-

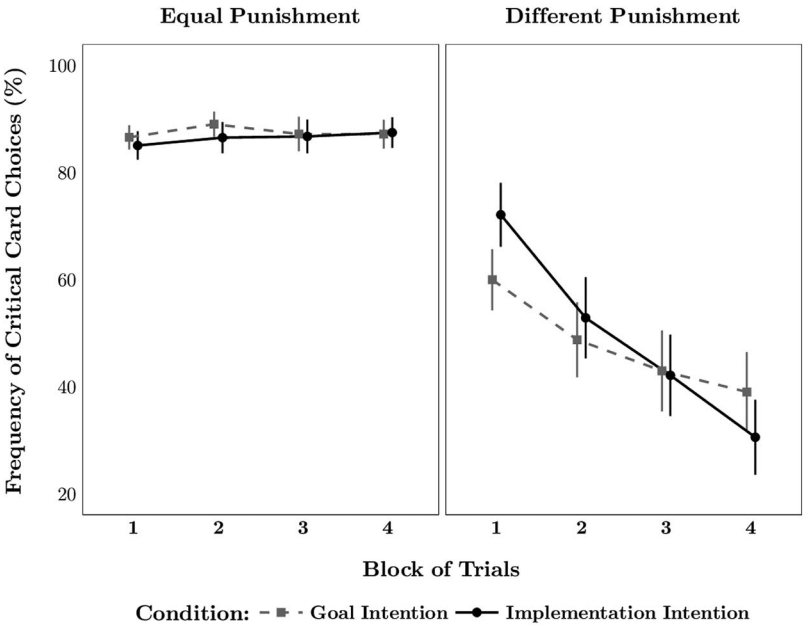

Figure 4. Critical choices as a function of Punishment, Trial (averaged into four blocks for plotting), and Condition in Experiment 3. Error bars represent standard errors of the mean.

haviors that are associated with disproportionate costs even after having formed implementation intentions.

Interestingly, the decline in goal-directed behavior was significantly stronger among implementation intention than goal intention participants. As Figure 4 indicates, this finding was in part due to the fact that implementation intentions facilitated goal-directed behavior at the beginning of the task, which might be interpreted as an initial tenacity similar to what we observed in Experiments 1 and 2. At the end of the task, however, implementation intention participants performed goal-directed behaviors less frequently than goal intention participants, indicating a more complete disengagement from the goal-directed behaviors. Given that the effects of implementation intentions are goal-dependent (e.g., Sheeran et al., 2005), this more complete disengagement might be due to the decrease of goal commitment observed in the implementation intention condition.

Importantly, both goal and implementation intention participants steadily performed the goal-directed behavior when it was punished by the same monetary loss as performing the alternative behavior (i.e., the equal-punishment conditions). This observation is incompatible with the assumption that the mere presence of punishment might decrease the effectiveness of goal intentions by taxing cognitive resources, while leaving implementation intentions unaffected. Instead, it blends in with the results of Experiment 2, suggesting that the effects observed in our punishment conditions are indeed reflecting how people respond to the costs of performing goal-directed behaviors.

Finally, we also reasoned that backing away from goal-directed behaviors in response to punishment might be accompanied by reduced goal commitment. Our data were in line with this idea. Unexpectedly, however, this finding was primarily due to implementation intention participants, while goal intention participants maintained a rather high goal commitment despite backing away from performing goal-directed behaviors. This might explain why implementation intention participants disengaged more strongly from performing goal-directed behaviors than did goal intention participants.

General Discussion

Implementation intentions facilitate goal attainment across a variety of domains by helping people to automatically perform goal-directed behaviors when they encounter critical situations. Performing these behaviors might also entail various costs, however, and successful goal striving thus requires flexible tenacity (Brandtstädter & Rothermund, 2002; Gollwitzer et al., 2008): holding on to behaviors associated with unpleasant or annoying costs that are still bearable but backing away from excessively costly behaviors. In the present research, we hypothesized that goal striving with implementation intentions is characterized by such flexible tenacity. In a set of three experiments, we observed that goal-directed behaviors associated with bearable costs were tenaciously performed with implementation intentions but not with goal intentions. In contrast, people flexibly backed away from goal-directed behaviors that were associated with excessive costs, both after having formed goal and implementation intentions. Taken together, this pattern of results corroborates our hypothesis that goal striving with implementation intentions is best characterized as flexibly tenacious.

We varied punishment in our experiments to establish various costs of performing goal-directed behaviors. In Experiments 1 and 2, we presented a mildly aversive stimulus (i.e., noise and effort, respectively) each time people performed a goal-directed behavior, thus establishing bearable costs. To establish excessive costs in Experiment 3, we removed a desirable and valuable stimulus (i.e., money) whenever a goal-directed behavior was performed. Across all three experiments, irrespective of the corresponding costs, goal intention participants disengaged from performing goal-directed behaviors. Complementing our questionnaire data, this observation suggests that punishment was successful, indicated by the reduced frequency of the punished behavior (Azrin & Holz, 1966; Johnston, 1972). Implementation intention participants revealed a more complex pattern, however, holding on to performing goal-directed behaviors in the face of bearable costs but disengaging when encountering excessive costs.

Importantly, our findings could not be accounted for by differences in the perceived unpleasantness of the punishment (Experiments 1

and 3). Moreover, our control conditions revealed that goal and implementation intention participants similarly held on to performing goal-directed behaviors both in the complete absence of punishment (Experiment 2) and when the goal-directed and the alternative behavior were punished equally (Experiment 3). This observation discourages two otherwise conceivable alternative explanations of our results: First, the differences between goal and implementation intentions are unlikely to reflect that goal intentions become less effective over time, while implementation intentions remain equally effective. Second, the results from our control conditions are also not compatible with the idea that punishment selectively derails goal intentions by taxing required cognitive resources, while not affecting the resource-independent, bottom-up automaticity engendered by implementation intentions. Taken together, this evidence provides solid grounds for interpreting our results in terms of the costs of performing goal-directed behaviors.

Explaining the Flexible Tenacity Engendered by Implementation Intentions

How can we explain the flexibly tenacious goal striving engendered by implementation intentions? We observed that goal and implementation intention participants differed neither in terms of their goal commitment at the beginning of the task (Experiment 3) nor with regard to their perception of the punishment as unpleasant (Experiments 1 and 3). Accordingly, forming implementation intentions did not merely alter the desirability or feasibility of task performance in the first place—an observation that is well in line with prior research (e.g., Webb & Sheeran, 2008). However, as outlined in our introduction, forming implementation intentions reduces the effort required for performing a task in comparison to goal intentions because it automates goal-directed behaviors (Freydefont et al., 2016). Accordingly, implementation intention participants have to invest less effort than goal intention participants to successfully perform goal-directed behaviors. In line with motivational intensity theory (Brehm & Self, 1989), this reduced effort should result in more tenacious goal striving as long as successful task performance is possible and justified. Crucially, we varied the justification for successful performance by inflicting different costs of performing goal-directed behaviors. In Experiments 1 and 2, these costs were bearable and justified the low effort required from implementation intention participants, but not the comparatively higher effort required from goal intention participants. Consequently, implementation intention participants tenaciously performed goal-directed behaviors, whereas goal intention participants backed off. In Experiment 3, however, the excessive costs of performing goal-directed behaviors did not even justify the low effort required from implementation intention participants, who therefore backed off from performing goal-directed behaviors as well.

While motivational intensity theory provides a compelling explanation for the flexible tenacity of implementation intentions observed in the present research, an alternative explanation is also possible. Specifically, it has been suggested that the automation of goal-directed behaviors by forming implementation intentions conserves self-regulatory resources (Bayer, Gollwitzer, & Achtziger, 2010; Martijn et al., 2008). In terms of resource models of self-regulation (Baumeister, Bratslavsky, Muraven, & Tice, 1998), implementation intentions should accordingly render goal striving more efficient, freeing up resources that can be used for dealing with difficulties emerging during goal striving. The additional self-regulation resources might then have been sufficient to help implementation intention participants dealing effectively with bearable costs, but insufficient for dealing with excessive costs. These two explanations—in terms of adaptive effort mobilization and self-regulatory resource conservation—are not mutually exclusive and can both account for our present findings. We feel that future research should discern between them to further enhance our understanding of how implementation intentions engender flexible tenacity.

Implications of the Present Research

The most important theoretical implications of our findings pertain to research on the flexible and tenacious characteristics of implementation intentions (Gollwitzer et al., 2008). Our results suggest the costs associated with performing goal-directed behavior as one key factor in tipping the balance between flexibility and tenacity: As long as the costs are bearable,

implementation intentions seem to be best characterized as instant habits, providing tenacity that helps attaining goals. Goal striving with implementation intentions is much more flexible, however, when costs are disproportionate, potentially jeopardizing the attainment of other important goals. Accordingly, forming implementation intention facilitates flexibly tenacious goal striving.

The present research also yields additional insights into successful goal-striving. In Experiment 3, we reasoned that both goal and implementation intention participants should disengage from performing goal-directed behaviors because the excessive costs of holding on to them (i.e., losing money). While our results were consistent with this idea, two unexpected differences between goal and implementation intention condition evinced. First, disengagement was significantly stronger among implementation intention compared to goal intention participants. This finding appeared in part due to the fact that implementation intentions facilitated goal-directed behavior at the beginning of the task, which might be interpreted as an initial tenacity similar to what we observed in Experiments 1 and 2. At the end of the task, however, implementation intention participants performed goal-directed behaviors less frequently than goal intention participants, indicating a more complete disengagement from the goal-directed behaviors. More complete disengagement was also reflected in the second noteworthy difference between the goal and implementation conditions in Experiment 3. While goal intention participants maintained a rather high level of goal commitment, we observed a significant decrease among implementation intention participants. Reducing goal commitment when ceasing to perform goal-directed behaviors is an important aspect of well-being, guarding against negative affect and distress resulting from not acting toward a valued goal (Heckhausen, Wrosch, & Schulz, 2010; Klinger, 1975; Wrosch, Scheier, Carver, et al., 2003; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Taken together, the results of Experiment 3 suggest that people benefit more strongly from implementation intentions than goal intentions in situations that require disengagement from performing goal-directed behaviors.

Future Directions

Finally, we want to emphasize two features of the present research that might stimulate future research. First, we conducted a well-controlled, computerized lab study that allowed us to establish well-defined costs of performing goal-directed versus alternative behaviors, and to measure which behaviors people choose as a function of these costs. Naturalistic settings might be more complex, however, involving a variety of possible behaviors differing in their associated costs. Returning to the jogging example from the beginning, people might switch to several alternative behaviors to attain their fitness goal (e.g., cycling, swimming, hiking) that might vary both in their instrumentality and their associated costs (e.g., time and equipment requirements). It seems worthwhile to study whether the results of the present experiments generalize to such naturalistic settings. Second, we used three qualitatively different forms of punishment, trying to maximize the difference between bearable and excessive costs. This enabled us to determine whether goal striving with implementation intentions is in general sensitive to different costs of performing goal-directed behaviors. Future research might complement our approach with a continuous manipulation of these costs. For instance, the costs of performing goal-directed behaviors might be continuously enhanced over the course of time, thus revealing the transition point at which goal-striving with implementation intentions switches from being tenacious to being flexible.

Conclusion

Forming implementation intentions (if-then plans) is a self-regulation strategy that helps people to attain their goals by facilitating the performance of goal-directed behaviors. Besides their positive effects on goal-attainment, goal-directed behaviors might, however, entail various costs as well. In the present research, people held on to performing goal-directed behaviors that inflicted unpleasant or annoying but bearable costs, but flexibly backed off from engaging in excessively costly behaviors after having formed implementation intentions. This suggests that goal striving with implementation

intentions is best characterized as being flexibly tenacious.

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Correction to Stanek and Richter (2016)

In the article "Evidence Against the Primacy of Energy Conservation: Exerted Force in Possible and Impossible Handgrip Tasks" by Joséphine Stanek and Michael Richter (*Motivation Science,* 2016, Vol. 2, No. 1, pp. 49–65. http://dx.doi.org/10.1037/mot0000028) the second paragraph of the General Discussion section incorrectly referred to "high difficulty groups" rather than "moderate difficulty groups" when discussing Pantaleo, Miron, Ferguson, and Frankowski's (2014) article. The corrected text follows: "They observed that in the control and the moderate difficulty groups emotion intensity (the intensity of group identification) increased compared with a baseline measure. If one considers the felt emotion intensity before the presentation of the goal deterrent to reflect the maximally justified intensity, the intensity increase in the control and the moderate difficulty groups might be interpreted as evidence for excess emotion intensity."

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