Original Article

Mindsets Affect Risk Perception and Risk-Taking Behavior

Illusory Optimism and the BART

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Abstract: In two experiments, we investigated the downstream consequences of activating deliberative versus implemental mindsets on risk perception (Experiment 1) and risk-taking behavior (Experiment 2). We hypothesized that participants in an implemental versus deliberative mindset arrive at more optimistic judgments about their own risks of experiencing negative life events, compared to other peoples' risks. The results of Experiment 1 confirm this hypothesis and reveal perceived controllability as an important moderator. Experiment 2 further augments these findings by demonstrating that participants in a deliberative mindset show less risk-taking behavior than participants in an implemental mindset using a behavioral risk task. Implications for research on mindset theory of action phases and mindset-dependent effects on risk perception and risk-taking behavior are discussed.

Keywords: mindsets, risk perception, risk-taking behavior, BART, illusory optimism

People tend to be unrealistically optimistic about their own future as compared to the future of others. When Weinstein (1980) asked college students about their likelihood as well as the likelihood of an average peer to encounter various events, students saw their chances to encounter positive events as above average but their risk to encounter negative events as below average. This illusory optimism has been shown to be affected by the current phase of unrelated goal pursuit (Taylor & Gollwitzer, 1995). When deliberating between potential options, participants are more realistic and rate themselves to be more at risk compared to when planning the implementation of a chosen goal. However, changes in risk perception do not always translate into changes in risk taking (Sheeran, Harris, & Epton, 2014). In the present research, we test whether the current action phase of an individual evoked by an unrelated goal pursuit has similar downstream consequences on both risk perception and risk-taking behavior. Therefore, we will first introduce mindset theory of action phases (Gollwitzer, 1990, 2012), followed by research on its interplay with risk perceptions, and, thereafter, research on its interplay with risk-taking behavior building up to the present research.

Mindsets: Deliberative Versus Implemental

The psychological states targeted in the present research are deliberative and implemental mindsets. These mindsets are associated with deliberating a decision to be made and planning out the implementation of a chosen project, respectively. Gollwitzer and Kinney (1989) found that asking participants to deliberate on the pros and cons of moving forward with an unresolved personal problem versus asking people to plan the implementation of a chosen project lead to reduced feelings of control over an, in fact, random and thus uncontrollable outcome in a subsequent unrelated contingency learning task. In this task, participants were asked to produce the onset of a target light by either pressing a button or abstaining from pressing it. Unbeknownst to the participants, target light onset was independent of their button pressing action (i.e., whether or not they pressed the button), as the target light's onset was linked with the same likelihood to pressing and not pressing the button. However, in one condition target light onset was frequent (i.e., 75% after pressing as well as non-pressing responses) and infrequent in the other

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DOI: 10.1027/1864-9335/a000304

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condition (25% after pressing as well as non-pressing responses). The authors observed that participants who had deliberated the pros and cons of an unresolved personal problem (e.g., shall I move to a different city) were more realistic as compared to participants who had planned out the implementation of a chosen project (e.g., moving to a different city). In the frequent target light onset condition, implemental mindset participants showed a stronger illusory control as compared to the infrequent target light onset condition. Deliberative mindset participants, in contrast, generally showed low confidence of having produced the target light onset by their way of pressing or not-pressing the critical button; in other words, frequent target light onset did not produce an illusion of control.

Why does deliberating versus planning out one's decisions have these consequences on the perceived degree of control? Mindset theory of action phases (i.e., MAP; Gollwitzer, 1990, 2012) suggests that in the course of goal pursuit, individuals traverse through several successive but distinct action phases, each posing unique challenges or task demands, which are best met by matching mindsets (i.e., the activation of the needed cognitive procedures). Given that individuals commonly entertain many wishes but possess only limited resources like time or applicable effort, they are forced to decide which wishes are actually worth pursuing. Thus, before making a decision to turn a given wish into a goal to be pursued, people commonly deliberate the pros and cons of moving forward with one of their many wishes. This evokes a mindset (i.e., the deliberative mindset) that is characterized by features of open-mindedness (e.g., even peripheral, incidental information is processed; Büttner et al., 2014; Fujita, Gollwitzer, & Oettingen, 2007), impartial processing of desirability-related information (e.g., pros and cons are given equal weight; Bayer & Gollwitzer, 2005; Taylor & Gollwitzer, 1995), and realistic judgments of feasibility (e.g., more cautious estimates of probabilities of success; Puca, 2001).

Once the decision to pursue a certain wish has been made (i.e., one has set a goal), however, the next step toward goal attainment is planning out when, where, and how to implement the chosen goal, which leads to the activation of the implemental mindset. This mindset is characterized by just the opposite features of the deliberative mindset (e.g., Armor & Taylor, 2003; Brandstätter & Frank, 2002). Participants in an implemental mindset evince closed-mindedness (e.g., peripheral information is ignored; Bayer & Gollwitzer, 2005; Büttner et al., 2014; Fujita et al., 2007), partial processing of desirability-related information (e.g., pros receive more weight than cons; Taylor & Gollwitzer, 1995, Study 3), and optimistic judgments of feasibility (e.g., illusions of control; Gollwitzer & Kinney, 1989; shorter time estimates with respect to attaining the goal; Brandstätter, Giesinger, Job, & Frank, 2015).

Crucially, both deliberative and implemental mindsets carry over to various subsequent tasks independent of the original task that evoked them. Thereby, they differ from mere task sets. In research on MAP (summaries by Gollwitzer, 2012; Gollwitzer & Keller, 2016), a deliberative mindset is activated by having people list short-term and long-term positive and negative consequences of acting or not acting on an unresolved personal problem, trying to answer the question of whether to make a change decision or stay with the status quo. An implemental mindset, in contrast, is activated by asking people to list the steps required for successful attainment of a chosen personal project and then explicate for each of these steps when, where, and how it is to be initiated. In the present research, we activate mindsets to investigate their effects on one facet of risk perception (i.e., illusory optimism concerning negative life events) and risk-taking behavior.

Risk Perception

Illusory optimism (i.e., people are optimistic concerning their own chances/risks in relation to the chances/risks of their respective peer group; recent reviews by Shepperd, Klein, Waters, & Weinstein, 2013; Shepperd, Waters, Weinstein, & Klein, 2015) is widespread. For instance, it affects car drivers and their perceived risk of a traffic accident, smokers and their perceived risk of contracting smoking-related illnesses, and newly-weds and their perceived risk of divorce (Arnett, 2000; Baker & Emery, 1993; DeJoy, 1989). Research has attempted to identify moderators of the extent to which individuals show such illusory optimism (summaries by Klein & Helweg-Larsen, 2002; Sharot, 2011). For example, Kos and Clarke (2001) observed significantly more illusory optimism for events an individual has some control over compared to events an individual cannot control. Therefore, the authors concluded that perceived control over experiencing a negative life event is an important moderator of the degree of illusory optimism.

Knowing that deliberative versus implemental mindsets decrease versus enhance feelings of control (Gollwitzer & Kinney, 1989), Taylor and Gollwitzer (1995) wondered whether being in a deliberative (implemental) mindset would also reduce (enhance) illusory optimism. Therefore, they assessed illusory optimism with respect to negative life events, using four negative life events that were rated to be relatively controllable in a pretest (e.g., addiction to prescription drugs, divorce), as well as four separate negative life events that were assumed to be relatively uncontrollable (e.g., losing a partner to an early death, developing diabetes). They found that the activation of an implemental mindset enhanced illusory optimism, whereas the activation of a deliberative mindset reduced illusory optimism, both being especially true for negative life events perceived as controllable.

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Risk Taking

Many health behavior theories (for a critical review, see Noar & Zimmerman, 2005) suggest risk perceptions to be a central antecedent of risk-taking behavior. However, similar to research marking a gap between behavioral intentions and actual behavior (Sheeran, 2002), Sheeran et al. (2014) report a meta-analysis suggesting that interventions which were successful in altering (i.e., heightening) risk perceptions to a medium-to-large degree ($d_+ = 0.75$) only lead to a small-to-medium change in risk-related intentions ($d_+ = 0.36$) and to an even smaller reduction ($d_+ = 0.25$) in actual risk-related behavior. Accordingly, we wondered whether mindset effects on risk perception also translate into respective effects on risk taking.

Further corroborating this line of thought, research on the effects of mindsets on decision-making under risk has painted a rather complex picture. Hügelschäfer and Achtziger (2014) have investigated mindset effects on behavioral decisions in hypothetical financial gambles. In line with the effects on risk perception (Taylor & Gollwitzer, 1995), female participants in an implemental mindset more readily took risks when compared to female participants in a deliberative mindset. However, male participants evinced the reverse pattern so that the widespread finding that women are more risk averse than men (Eckel & Grossman, 2008) was replicated only for participants in a deliberative mindset. Conversely, Rahn, Jaudas, and Achtziger (2016) found no differences in risk-taking behavior between mindset conditions using an eye-tracking paradigm. With increasing difficulty, however, participants in a deliberative mindset were more efficient (i.e., faster) in making decisions compared to participants in an implemental mindset; however, decision quality was not affected. To summarize, it remains unclear whether alterations in risk perceptions caused by the activation of different mindsets carry over to alterations in risk-taking behavior. Taking prior findings into account, it seems reasonable to assume that participants in an implemental mindset are more optimistic and therefore more prone to take risks but because it has not been tested yet, we test this novel hypothesis in Experiment 2. For this purpose, we utilize the Balloon Analogue Risk Task (BART; Lejuez et al., 2002). This task has been used to assess risk taking in a more naturalistic setting than the usual assessment through monetary gambles (summary by Charness, Gneezy, & Imas, 2013). In the BART, participants decide repeatedly whether to keep pumping up a balloon, which increases its monetary value but also its probability to burst and losing all of the money collected so far, or to save its current monetary value by refraining from further pumping. The BART is quite naturalistic as it resembles cumulative everyday life risks and attesting to this conceptual similarity, smokers take more risks in the BART than nonsmokers (Lejuez, Aklin, Jones, et al., 2003).

The Present Research

We argue that individuals differ in their risk perception and risk-taking behavior depending on their currently activated, action-phase-related mindsets. Experiment 1 focuses on the effects of mindset induction on risk perception, more specifically the illusory optimism regarding negative life events in a rather close replication of Taylor and Gollwitzer's Study 2 (1995). In Experiment 1, we expect that activating an implemental mindset should increase illusory optimism while activating a deliberative mindset should result in decreased illusory optimism – especially when the critical negative life event is perceived as controllable. We expect the control group to lie in between both mindset conditions (i.e., less optimistic than participants in the implemental mindset condition but more optimistic than participants in the deliberative mindset condition).

In Experiment 2, we move on to the investigation of risk-taking behavior. In line with Experiment 1, we expect participants in an implemental mindset, compared to participants in a deliberative mindset, to exert more risk-taking behavior as measured via an established risk-taking assessment tool, the BART. Once again, we expect the control group to be in between both mindset conditions.

We report how we determined our sample sizes, all data exclusions (if any), all manipulations, and all measures in the study.

Experiment 1: Mindsets and Risk Perception

Before expanding upon research studying mindset effects on risk perception to mindset effects on risk-related behavior, we aimed to replicate and advance the Taylor and Gollwitzer (1995) studies on illusory optimism regarding negative life events. This was mainly done because of two reasons. First, in all the studies of Taylor and Gollwitzer (1995), data of the control condition were collected using a different setting and procedure than that applied in the implemental and deliberative mindset conditions; this impedes a reliable interpretation of the observed effects in terms of mindsets. To account for this shortcoming, we now made all experimental conditions more similar to each other by using the same setting and procedures. Second, when analyzing attitudes on radon testing, Weinstein and Lyon (1999) could not replicate the effects of mindsets on illusory optimism observed by Taylor and Gollwitzer (1995). Participants who had decided to take on radon testing saw themselves more at risk than participants who were undecided, even after watching a video with new information about the risks of radon.

Note, however, that the authors equated being decided in favor of a protective behavior (i.e., to test their house for radon exposure) as equivalent to the induction of an implemental mindset which is commonly achieved by asking participants to plan the implementation of an unrelated decision. Therefore, before investigating mindset effects on risk taking, we must first accurately assess mindset effects on risk perception.

Method

Participants, Design, and Sample Size Considerations

One hundred fourteen high school students volunteered for the experiment. We randomly assigned them to one of the three experimental conditions of our 3 between (mindsets: deliberative vs. implemental vs. control) × 2 within (negative life events: controllable vs. uncontrollable) mixed design. Participants (58% female) were on average 16.9 years old (SD = 0.7; min = 16, max = 19). The required sample size was calculated beforehand using G*Power3 (Faul, Erdfelder, Lang, & Buchner, 2007). Based on previous research (Taylor & Gollwitzer, 1995), we assumed a medium-to-large effect of d = 0.69 for the direct comparison between both mindset conditions. The required sample size of 34 participants per cell to detect an effect of this size at 80% power was reached in all conditions.

Pilot Study

To identify negative life events that vary in terms of perceived controllability, we conducted a pilot study (see Electronic Supplementary Material, ESM 1). Twenty-three freshmen psychology students filled out a questionnaire in a classroom setting, rating the degree of controllability of 39 negative life events on a scale ranging from 1 = "*very uncontrollable*" to 6 = "*very controllable*." Using events with low and high means, respectively, as well as preferably small ranges, we identified four controllable and four uncontrollable negative events to be used in Experiment 1. The four negative events consistently perceived as controllable were: contracting the human immunodeficiency virus (HIV), developing a drinking problem, becoming obese, and committing a felony. The four negative events consistently perceived as uncontrollable were: becoming a victim or eyewitness of a terrorist attack, losing one's partner to an early death, becoming a victim of a violent crime, and contracting the flu. The respective means and standard deviations are given in Table 1.

Table 1. Perceived controllability of the eight risks used in Experiment 1

	M (*SD*)
Controllable risks	
Committing a felony	5.22 (0.52)
Contracting HIV	4.91 (0.67)
Developing a drinking problem	4.86 (0.83)
Becoming obese	4.70 (0.70)
Uncontrollable risks	
Being a victim or eyewitness to a terrorist attack	1.22 (0.42)
Losing a partner to an early death	1.39 (0.58)
Being a victim of violent crime	1.61 (0.58)
Contracting the flu	2.87 (1.06)

Note. Answers were recorded on a scale reaching from 1 = "*very uncontrollable*" to 6 = "*very controllable*."

Procedure

Participants in the main experiment received two questionnaires. The first questionnaire pertained to the mindset manipulation. The second, ostensibly unrelated questionnaire assessed the perceived probability of encountering several negative life events (i.e., our dependent variable), mood, and demographics, in this order. Thereafter, we thanked participants for their participation and thoroughly debriefed them.

Mindset Manipulation

Participants in the deliberative mindset condition read instructions that asked them to name an unresolved, personal problem that currently occupied their mind; they should not have made any decision yet whether to take action or stick to the status quo. We explicitly asked them not to name a mundane, easily solvable problem and gave examples for an appropriate problem (e.g., whether to befriend a certain person). Hence, an appropriate problem had the form of "Should I… or not?" After naming their individual problem, participants had to think about immediate and long-term, positive and negative consequences of both making a change and not making a change decision.

Participants in the implemental mindset condition read instructions that asked them to name a project, currently occupying their mind, for which they had made a decision to take action but did not initiate any further steps yet. Parallel to the deliberative mindset manipulation, participants were asked not to name a mundane project and were given examples (e.g., to get to know a certain person). Hence, an appropriate project had the form of "I intend to…!" After naming their personal project, participants listed up to five necessary steps needed to achieve their goal, and then planned out when, where, and how to act to implement each of the named steps.

Participants in the control condition read instructions that asked them to search for the letter "m" in a 698-word, 6-paragraph long excerpt from a book in Czech. This task was modeled after previous control conditions in psychological research (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998). We used the Czech language because very few German high school students can speak it, it is written

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in the Latin alphabet, and it possesses a word and sentence length similar to German.

Dependent and Control Variables

To create the impression of participating in two independent surveys, we printed the second questionnaire using a different font, font size, layout, thicker paper, and a new cover page. In the second questionnaire, participants first rated how likely it is for an average student of their age and gender, and then how likely it is for themselves to encounter the pretested eight negative life events (i.e., four controllable and four uncontrollable ones) on a scale from 1 = "*not at all likely*" over 4 = "*fairly likely*" to 7 = "*very likely*." The exact wording was "Please indicate how likely you think it is that an average student of your age and gender encounters the following events" and "Now we would like you to indicate how likely you think it is that you yourself encounter the following events." Following this, participants filled out the German version of the Positive and Negative Affect Schedule (PANAS; Krohne, Egloff, Kohlmann, & Tausch, 1996). Participants rated their current experience of 10 positive (Cronbach's α = .80) and 10 negative (Cronbach's α = .85) feelings and emotions. Then, participants reported on their age, gender, height, and their parents' educational background; all of these variables have been found to be associated with risk taking in general (Dohmen et al., 2011).

To assess our dependent variable of illusory optimism, we first replaced missing values (3 out of 1,824) by the respective sample means. Then, ratings for the self were summed up and subtracted from the sum of the ratings for the average other. We did this for all eight risks combined, as well as separately for controllable and uncontrollable risks, resulting in three indices of illusory optimism. Scores below zero indicate that participants think of themselves as more risk-prone than the average other, whereas positive scores indicate that participants feel less risk-prone than the average other (i.e., illusory optimism). Please note, the scores for controllable and uncontrollable risks sum up to the score of all risks combined.

Results

Preliminary Analyses

First, we tested whether all three experimental conditions exhibited illusory optimism (i.e., scores being significantly larger than zero), which turned out to be the case (ts $\geq$ 2.49, ps $\leq$ .017, two-sided). Moreover, we compared positive and negative affect as assessed by the PANAS and found no significant differences between conditions, Fs $\leq$ 1.62, ps $\geq$ .202. However, negative affect correlated with two of the illusory optimism scores (with all eight negative life events, $r(114) = -.23$, p = .014, and the four controllable negative life events, $r(114) = -.24$, p = .011). Including negative affect as a covariate did change the pattern of significance slightly which is why we report the main analyses without (i.e., ANOVA) and with negative affect as a covariate (i.e., ANCOVA); however, the mindset effects on illusory optimism concerning controllable negative life events stayed unaffected (see below). No other variables (i.e., age, height, sex, parental education, positive affect) correlated with any of the illusory optimism scores, $|r|$s $\leq$ .11, ps $\geq$ .230.

Main Analyses

To test our hypothesis that participants differ in their illusory optimism with respect to encountering controllable versus uncontrollable negative life events, we first subjected illusory optimism scores to a 3 between (mindset: implemental vs. deliberative vs. control) $\times$ 2 within (negative life events: controllable vs. uncontrollable) mixed-design analysis of variance (ANOVA). The ANOVA rendered a significant main effect of controllability, $F(1, 111) = 188.88$, $p < .001$, $\eta_p^2 = .630$, 90% CI [.539, .693]. The interaction between mindset condition and controllability did not reach conventional levels of significance, $F(2, 111) = 2.04$, p = .135, $\eta_p^2 = .035$, 90% CI [.000, .096]. Controlling for negative affect in an analysis of covariance (ANCOVA) rendered a significant but weakened main effect of controllability, $F(1, 110) = 41.89$, $p < .001$, $\eta_p^2 = .276$, 90% CI [.163, .378], whereas the interaction between experimental condition and controllability reached marginal significance, $F(2, 110) = 2.67$, p = .073, $\eta_p^2 = .046$, 90% CI [.000, .113]. More importantly, dropping the control condition to further explore the difference between implemental and deliberative mindset conditions, rendered a marginally significant interaction between mindset conditions and controllability in a mixed-design ANOVA with only the two mindset conditions (between: deliberative vs. implemental) and negative life events (within: controllable vs. uncontrollable), $F(1, 69) = 3.75$, p = .057, $\eta_p^2 = .052$, 90% CI [.000, .154]. Controlling for negative affect rendered this interaction statistically significant in the respective ANCOVA, $F(1, 68) = 4.88$, p = .031, $\eta_p^2 = .067$, 90% CI [.003, .177].

When comparing the three experimental conditions with respect to the illusory optimism scores of all eight negative life events combined, an ANOVA showed no statistically significant difference between experimental conditions, $F(2, 111) = 2.05$, p = .134, $\eta_p^2 = .036$, 90% CI [.000, .097]. But adding negative affect as a covariate rendered a significant main effect of experimental condition in the ANCOVA, $F(2, 110) = 3.25$, p = .042, $\eta_p^2 = .056$, 90% CI [.001, .127].

Finally, planned contrasts comparing deliberative and implemental mindset conditions were marginally significant in the ANOVA, $F(1, 111) = 3.42$, p = .067, $\eta_p^2 = .030$, 90% CI [.000, .098], and statistically significant in the ANCOVA,

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Table 2. Individual difference scores (illusory optimism) for each negative life event as a function of mindset condition

	Implemental (n = 36)	Deliberative (n = 35)	Control (n = 43)
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Controllable risks			
Committing a felony	2.31 (1.56)	1.37 (1.72)	1.54 (1.30)
Contracting HIV	1.25 (1.32)	0.83 (0.99)	1.00 (1.16)
Developing a drinking problem	2.11 (1.88)	1.57 (1.40)	2.09 (1.46)
Becoming obese	2.03 (1.68)	1.83 (2.07)	1.58 (1.56)
Uncontrollable risks			
Losing a partner to an early death	0.18 (1.47)	−0.06 (0.84)	0.09 (1.11)
Being a victim of a violent crime	0.56 (1.08)	0.86 (1.26)	0.54 (1.39)
Contracting the flu	0.67 (1.43)	0.34 (1.26)	0.42 (1.35)
Being a victim or eyewitness of a terrorist attack	0.03 (1.00)	0.14 (0.77)	−0.05 (0.72)

Note. Answers for both the average other risk and the risk for oneself were recorded on a scale reaching from 1 = "*not at all likely*" to 7 = "*very likely*." Thus, difference scores could range between −6 (lower perceived risk for average other) and 6 (higher perceived risk for average other).

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$F(1, 110) = 5.26$, $p = .024$, $\eta_p^2 = .046$, 90% CI [.003, .122]. Participants in the implemental mindset condition evinced increased illusory optimism ($M = 9.13$, $SD = 5.97$) compared to participants in the deliberative mindset condition ($M = 6.89$, $SD = 4.92$); control participants were in between ($M = 7.21$, $SD = 4.43$). In Table 2, we provide a breakdown of the illusory optimism scores for each of the negative events as a function of experimental condition.

Most importantly, we then compared illusory optimism for controllable and uncontrollable risks across experimental conditions. We observed considerable variation for controllable events, $M_{implemental} = 7.69$ ($SD = 4.09$) versus $M_{control} = 6.21$ ($SD = 3.17$) versus $M_{deliberative} = 5.60$ ($SD = 4.05$); marginally significant in the ANOVA, $F(2, 111) = 2.96$, $p = .056$, $\eta_p^2 = .051$, 90% CI [.000, .119], and significant in the ANCOVA, $F(2, 110) = 4.47$, $p = .014$, $\eta_p^2 = .075$, 90% CI [.009, .153]; see Figure 1 and Table 2. Planned contrasts comparing the mindset conditions were statistically significant in both the ANOVA, $F(1, 111) = 5.53$, $p = .020$, $\eta_p^2 = .047$, 90% CI [.004, .125], and ANCOVA, $F(1, 110) = 8.09$, $p = .005$, $\eta_p^2 = .068$, 90% CI [.012, .154]. Additional contrasts revealed that the implemental and control condition differed from each other according to both ANOVA, $F(1, 111) = 3.07$, $p = .083$, $\eta_p^2 = .027$, 90% CI [.000, .093], and ANCOVA, $F(1, 110) = 5.22$, $p = .024$, $\eta_p^2 = .045$, 90% CI [.003, .122], whereas the deliberative and control condition did not, $F(1, 111) = 0.51$, $p = .477$, and $F(1, 110) = 0.49$, $p = .487$, respectively. We conducted the same set of analyses for the uncontrollable events, however, we did not observe any significant differences, $Fs \leq 0.41$, $ps \geq .668$.

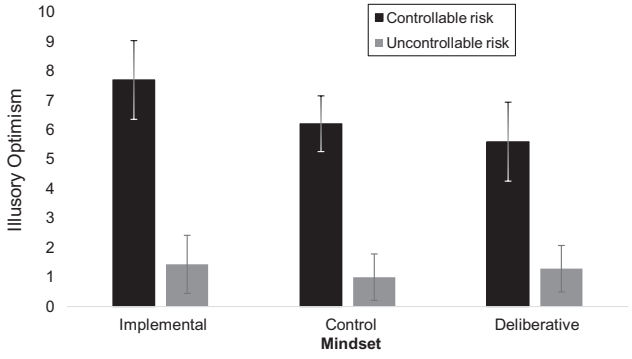

Figure 1. Experiment 1: Difference between self and average other ratings (illusory optimism) as a function of mindset condition and perceived controllability of negative life events (error bars represent 95% CIs).

Discussion

The results of Experiment 1 suggest that people's risk appraisals vary depending on their mindset. Compared to participants who pondered over the question of whether to take action regarding an unresolved personal problem (i.e., deliberative mindset), participants who plan out the when, where, and how of steps to implement a chosen personal project (i.e., implemental mindset) later saw themselves as less likely to experience negative life events in comparison to the average other. Our results fit in with those obtained by Taylor and Gollwitzer (1995) who demonstrated considerably weaker mindset effects on uncontrollable as compared to controllable negative life events. While Taylor and Gollwitzer (1995) observed reliable differences between mindsets on illusory optimism even in regard to uncontrollable negative life events, we could not observe these differences in our experiment. This may be because the participants of our pilot study chose rather extreme uncontrollable negative life events (e.g., a terrorist attack). Further studies on the relationship between mindsets and illusory optimism may thus control for perceived dread and frequency of the critical negative events as well. More importantly, the present replication

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helps to clarify the impact of mindsets on risk perception. Participants in an implemental mindset not only entertain more optimistic views about their personal control over outcomes (Gollwitzer & Kinney, 1989) but also about encountering various risks.

The illusory optimism exhibited by the participants of Experiment 1 was related to the degree of negative affect they evinced. Also, controlling for negative affect consistently increased the effect sizes of the difference between mindset conditions. In Experiment 1, we measured negative affect after the administration of the negative life events because we knew from earlier work (Taylor & Gollwitzer, 1995), and thus anticipated, that having to think about such negative life events (e.g., losing a partner to an early death) may evoke negative emotions among participants. Thus, by controlling for the influence thereof, we are able to paint a clearer picture of the true effect of mindsets on illusory optimism.

The results of Experiment 1 suggest that the basic pattern of findings of earlier work (Taylor & Gollwitzer, 1995) is holding up and that the conflicting findings of Weinstein and Lyon (1999) have to be explained otherwise (see General Discussion). While participants in the implemental mindset condition expressed marked illusory optimism, especially with respect to controllable negative life events, participants in the control condition lay in between both mindset conditions with participants in the deliberative mindset condition showing the least illusory optimism. However, this does not mean that participants in a deliberative mindset expressed "depressive realism" (Moore & Fresco, 2012). They still entertained optimistic beliefs about their personal future but were more realistic; this should be beneficial for the choice of adequate goals to be pursued.

To summarize, in Experiment 1 we observed more pronounced illusory optimism for controllable negative life events for participants in the implemental mindset condition compared to participants in the deliberative mindset condition. Thus, our assumption that action-phase-related mindsets have an impact on risk perception was confirmed. The question that remains open, however, is whether deliberative and implemental mindsets also manage to alter risk-taking behavior. We addressed this question in Experiment 2.

Experiment 2: Mindsets and Risk Taking

As outlined above, the link between risk perception and risk-taking behavior is not as clear as many theories (e.g., Ajzen & Fishbein, 2005) would predict. We thus wondered whether the mindset-induced changes in risk perception observed in Experiment 1 are mirrored by mindset effects on risk-taking behavior. In other words, will a deliberative mindset make people more risk averse, whereas an implemental mindset promotes risk seeking?

In Experiment 2, participants performed the BART (Lejuez et al., 2002). To control for interindividual differences in risk taking, we assessed peoples' general risk-taking propensity. However, anything measured after the mindset manipulation (e.g., people's general risk preferences) might be affected by it. Also, participants' performance on the BART might be affected by any prior measure of risk preferences, as merely taking this measure could have an impact on subsequent risk-taking behavior. To overcome these obstacles, we assessed all background variables in a separate experimental session.

Method

Participants, Design, and Sample Size Considerations

Seventy-five students (75% female) aged between 19 and 59 years (M = 23.6, SD = 5.4) of a German university took part in Session 2 and were randomly assigned to one of three experimental conditions (mindsets: deliberative vs. implemental vs. control). We collected data over the course of one semester and stopped when the semester ended. The resulting number of participants was comparable to studies using the BART as a dependent variable (e.g., Lejuez, Aklin, Jones, et al., 2003; Lejuez, Aklin, Zvolensky, & Pedulla, 2003), and it allowed us to reliably detect a medium-to-large effect of d = 0.73 at 80% power (Faul et al., 2007).

Procedure

Our Experiment was split into two sessions. At the beginning of the summer term, we invited the participants via an experiment management system (Greiner, 2015) to take part in Session 1. Participants of Session 1 (n = 148) were then invited to Session 2 about 2 weeks later. At the beginning of Session 2, participants filled out the mindset manipulation questionnaire. They then moved on to the BART and subsequently filled out the PANAS. Participants generated individualized codes at the end of both sessions, allowing us to anonymously match their data.

Session 1

This session started with an investment task designed to measure risk-taking propensity (Charness & Gneezy, 2012; Gneezy & Potters, 1997). In this investment task, participants were given an endowment of €1.00, and could invest a variable amount between €0.00 and €1.00 into a risky project, with a 50% chance to triple the investment and a 50% chance to lose it. The remaining amount (i.e., the amount not invested) was a certain part of their payoff.

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A coin was tossed at the end of the experiment to determine the outcome of the project. Higher investments reflect more pronounced preferences for taking risks because the expected payoff increases with any investment.

Thereafter, participants filled out a series of questionnaires. We assessed fear of negative evaluation by using a shortened questionnaire (Leary, 1983) in its German version (SANB-5; Kemper, Lutz, & Neuser, 2012) because previous research suggests it as a potential moderator of mindset inductions (Hiemisch, Ehlers, & Westermann, 2002). An example item of the SANB-5 is "When I am talking to someone, I worry about what they may be thinking of me"; each item is answered on a 4-point scale. Further, participants filled out two single-item self-ratings, one ten-point answer scale for willingness to take risks in general ("In general, are you willing to take risks or do you try to avoid taking risks?"; Dohmen et al., 2011) and one five-point answer scale for self-esteem ("I have high self-esteem"; Robins, Hendin, & Trzesniewski, 2001). At the end, participants provided standard demographic data and were requested to generate an individualized code following certain rules to enable us to match the data of Sessions 1 and 2. Participants' payout consisted of their profits from the investment task (maximum of €3.00) and a fixed show-up compensation of €3.00. Because Session 1 was also used to collect data for an unrelated research project conducted at this time, we additionally assessed Preference for Intuition and Deliberation (Betsch, 2004) and numeracy (via the Berlin Numeracy Test, BNT; Cokely, Galesic, Schulz, Ghazal, & Garcia-Retamero, 2012; and a Rasch-based numeracy scale; Weller et al., 2013).

Session 2

Data collection for Session 2 started 2 weeks after data collection for Session 1. However, because we ran both sessions in parallel it was possible for a participant to take part in shorter intervals but never on the same day. We slightly altered the example problems and projects of the mindset manipulations in the deliberative and implemental mindset conditions from Experiment 1 to be more appropriate to the sample of Experiment 2 (high school students in Experiment 1, mostly undergraduates in Experiment 2). The structure of the mindset manipulations remained unchanged. The text used in the control condition, however, was changed to a 639-word long random text with natural word length and character sequences, which seemed Latin but was mere nonsense. We changed to Latin from the Slavic Czech used in Experiment 1 because Experiment 2 was conducted in the summer term of 2014 following Russia's annexation of Crimea and we wanted to avoid any (subconscious) activation of unrelated concepts.

BART

We used the BART in an adapted version, implemented with PsychoPy (Peirce, 2007). It consisted of 20 trials (balloons) with participants having to hit the spacebar to pump. For every pump, the balloon increased in size and €0.05 were added to the current balloon's monetary value. For the sake of comparability, each balloon had a maximum number of possible pumps (ranging from 2 to 116, $M = 59$) and exceeding it made the balloon pop and led to a loss of the current balloon. Participants could avoid this by pressing an alternative key to save a balloon's monetary value early. In this case, the balloon's current value was shown to the participant and added to a permanent bank, the balance of which was shown throughout every trial on the top of the screen. Pumps and pops were accompanied by respective sound effects. Participants were instructed that balloons would differ in maximum size and that two of the balloons will be randomly chosen at the end of the experiment to determine their payout (plus a fixed show-up compensation of €3.00).

The BART offers two dependent variables: the number of popped balloons (i.e., participants did not stop pumping the balloon before reaching the balloon's maximum number of pumps) and the adjusted average number of pumps (i.e., the number of pumps a participant made on balloons that were saved before popping; see Pleskac, Wallsten, Wang, & Lejuez, 2008).

Results

Main Analyses

To test our hypothesis that participants in an implemental mindset exert comparatively riskier behavior, we conducted one-way ANOVAs with our experimental conditions as independent variable. For the adjusted average number of pumps, we found a significant difference between conditions, $F(2, 72) = 3.67$, $p = .030$, $\eta_p^2 = .092$, 90% CI [.005, .193]. A planned contrast comparing implemental and deliberative mindset conditions also revealed a significant difference, $F(1, 72) = 6.00$, $p = .017$, $\eta_p^2 = .077$, 90% CI [.008, .187]. Participants in an implemental mindset pumped the most often ($M = 46.25$, $SD = 14.43$), closely followed by participants in the control group ($M = 45.64$, $SD = 12.94$) and, with some distance, participants in a deliberative mindset ($M = 37.76$, $SD = 8.33$; see Figure 2). Accordingly, comparing the control condition to each of the mindset conditions rendered a different picture than in Experiment 1. Control participants differed significantly in their adjusted average of pumps from deliberative participants, $F(1, 72) = 5.07$, $p = .027$, $\eta_p^2 = .066$, 90% CI [.004, .172], but not from implemental participants, $F(1, 72) = 0.31$, $p = .861$.

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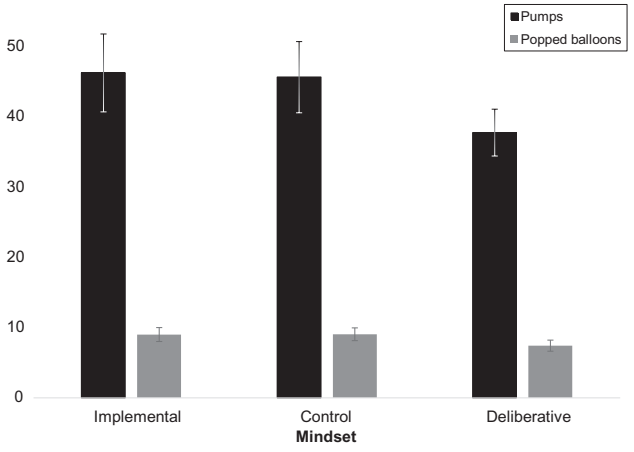

Figure 2. Experiment 2: Adjusted average number of pumps and popped balloons as a function of mindset condition (error bars represent 95% CIs).

We found a similar pattern when we analyzed the number of popped balloons. Again, there was a significant difference between conditions, $F(2, 72) = 3.93$, $p = .024$, $\eta_p^2 = .098$, 90% CI [.007, .201], and a significant planned contrast when comparing the two mindset conditions, $F(1, 72) = 5.85$, $p = .018$, $\eta_p^2 = .061$, 90% CI [.007, .184]. Participants in the implemental mindset and control conditions popped more balloons ($M = 9.00$, $SD = 2.58$; $M = 9.04$, $SD = 2.32$, respectively) than participants in a deliberative mindset ($M = 7.42$, $SD = 1.98$; see Figure 2). Accordingly, the control and implemental mindset conditions did not differ, $F(1, 72) = 0.00$, $p = .951$, but participants in the deliberative mindset and control conditions did, $F(1, 72) = 6.04$, $p = .016$, $\eta_p^2 = .077$, 90% CI [.008, .187]. Importantly, controlling for the individuals' risk preferences, as assessed by the investment task of Session 1, did not affect this pattern of findings. The same holds true for including negative affect (or any other variable we had assessed) as a covariate.

Further Exploratory Analyses

Speaking for its external validity, both BART scores correlated with the amount of money participants invested in the investment task in Session 1: $r(75) = .30$, $p = .009$, for the adjusted average number of pumps, and $r(75) = .36$, $p = .002$, for the number of popped balloons. Apparently, participants who invested more in the investment task of Session 1 subsequently pumped more often and let more balloons pop in Session 2. Interestingly, a post hoc analysis of the strength of this association separately for each experimental condition revealed differences between conditions. For the number of popped balloons, the association was the strongest for participants in the implemental mindset condition, $r(26) = .58$, $p = .002$, followed by participants in the control condition, $r(25) = .26$, $p = .206$ (the difference not significant, $z = 1.32$, $p = .187$), and participants in the deliberative mindset condition, $r(24) = .12$, $p = .563$ (marginally significant difference when compared to participants in the implemental mindset condition, $z = 1.78$, $p = .075$). For adjusted average number of pumps, the association was again the strongest for participants in the implemental mindset condition, $r(26) = .46$, $p = .019$, this time followed by participants in the deliberative mindset condition, $r(24) = .31$, $p = .143$, and participants in the control condition, $r(25) = .10$, $p = .635$ (the latter two correlation coefficients are not significantly different from the first correlation coefficient, $zs \leq 1.32$, $p \geq .187$).

Nonetheless, and as reported before, including the amount of money invested in the investment task as a covariate in our main analyses did not change the pattern of significance for the adjusted average number of pumps nor the number of popped balloons. There was also a significant correlation between numeracy (i.e., the BNT score) and both the adjusted average pumps, $r(75) = .31$, $p = .006$, and the number of popped balloons, $r(75) = .27$, $p = .020$. Again, including numeracy as a covariate did not change the pattern of significance. All other variables assessed in Session 1 showed no significant relationship with risk-taking behavior in the BART.

Discussion

The results of Experiment 2 strongly suggest that there is a mindset-dependent change in risk-taking behavior. The pattern of results mirrors the change in risk perceptions observed in Experiment 1. Participants in a deliberative mindset exerted less risk-taking behavior compared to participants in an implemental mindset; they exerted fewer pumps and let fewer balloons pop.

It is noteworthy that participants' risk perception (Experiment 1) and risk-taking behavior (Experiment 2) in the control condition varied in their similarity to the respective mindset conditions. While control participants fell in between mindset conditions in Experiment 1 (leaning toward the deliberative participants), they were indistinguishable from the implemental participants in Experiment 2. One possible explanation refers to the engaging nature of the BART (indicated by its correlation with sensation seeking; Lejuez et al., 2002) and its payoff structure. While there was no incentive to answer in a specific way in Experiment 1, the BART used in Experiment 2 is an incentivized behavioral measure that has an optimal, reward-maximizing strategy. Naïve participants usually do not know, learn, or apply the optimal strategy (i.e., the amount of pumps equals the average breaking point; see Lejuez et al., 2002). It is therefore commonly observed that participants on average pump well below the optimal level (e.g., Lejuez et al., 2007), even in a "colder" version where participants

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indicate in advance how often they want to pump for every balloon rather than engage in "hot" sequential pumping or, most strikingly, are informed about the optimal strategy beforehand (Pleskac et al., 2008). However, because participants usually pump on average below the optimal level, pumping more often and letting one or two extra balloons pop (i.e., approaching the optimal level) is on average more rewarding than saving a balloon too early. From a reward-maximization perspective and under the assumption of risk neutrality (i.e., neither discounting nor favoring uncertain outcomes compared to certain outcomes), pumping more often is therefore rational (as long as one does not surpass the optimal level) and this may be why control participants were exhibiting more risk-taking behavior, thus being more similar to implemental participants in Experiment 2 compared to being more similar to deliberative participants in Experiment 1.

More importantly, we observed more risk averse behavior of participants in a deliberative mindset compared to participants in an implemental mindset in Experiment 2. This effect may be driven by the lack of illusory control (Gollwitzer & Kinney, 1989) and illusory optimism (Taylor & Gollwitzer, 1995, the present Experiment 1). It is noteworthy, however, that both behavioral patterns (i.e., risk aversion in the deliberative mindset, risk seeking in the implemental mindset) are adaptive to the challenges of goal pursuit an individual must master in the respective action phase and therefore in line with MAP. It is helpful for individuals in an implemental mindset to take risks to implement a set goal, whereas it is similarly helpful for individuals in a deliberative mindset to remain cautious.

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General Discussion

The present set of studies was designed to test mindset effects on risk perception and risk-taking behavior. Consistent with MAP (Gollwitzer, 1990, 2012), we found less realistic risk perceptions (i.e., more illusory optimism) in participants with an implemental mindset compared to participants with a deliberative mindset. Importantly, this difference in risk perception is mirrored by participants' risk-taking behavior in Experiment 2. Participants in the deliberative mindset condition exerted less risk-taking behavior as they pumped less and let fewer balloons pop in the BART.

Mindsets and Risk Perception

In Experiment 1, we looked at one facet of risk perception, namely (illusory) optimism about encountering negative life events in the future. We found that participants in an implemental mindset as compared to a deliberative mindset see themselves much less at risk of encountering various negative life events than the average other and thereby successfully replicated earlier research (Taylor & Gollwitzer, 1995). Besides leading to the expression of less illusory optimism as observed in Experiment 1, individuals in a deliberative mindset might also be less prone to the formation of strong illusory optimism in the first place. Recent research offers an interesting view on the formation of illusory comparative optimism: *selective updating* (Korn, Sharot, Walter, Heekeren, & Dolan, 2014; Sharot et al., 2012; Sharot, Korn, & Dolan, 2011). Selective updating describes the tendency of individuals to update their personal beliefs in light of desirable feedback (e.g., suggesting lower risk) but not or to a lesser extent in light of undesirable feedback (e.g., suggesting higher risk). Strikingly, this asymmetry in updating is not due to systematic memory errors as participants can recall desirable and undesirable feedback equally well; moreover, people do not show selective updating in any similar magnitude for estimating base rate risks (Garrett & Sharot, 2014). This means that objective risk information may lead to updated base rate estimates but not updated risk perceptions for oneself. In other words, if participants of our experiment would have received objective information about developing a drinking problem that suggested higher risk, they might only use this information to update their base rate estimation but not their own personal risk. Incorporating such negative or undesirable feedback into one's own beliefs is aversive and, therefore, alterations in the extent of open-mindedness in information processing should exacerbate or diminish the asymmetries in updating. As mindsets are known to affect the open-mindedness during information processing (Bayer & Gollwitzer, 2005; Fujita et al., 2007) selective updating should also be less pronounced in a deliberative as compared to an implemental mindset.

Mindsets and Risk Taking

In Experiment 2, we used the BART to measure altered risk-taking behavior caused by pondering over or planning the implementation of an unrelated decision (i.e., activating deliberative vs. implemental mindsets). We found that participants in a deliberative mindset pumped the balloons less often and thus engaged in decreased risk-taking behavior compared to participants in an implemental mindset. One should note, however, that although its name suggests otherwise, the BART measures decision-making under uncertainty rather than risky decision-making (Knight, 1921). While decision-making under risk pertains to decisions in which decision-makers know all possible outcomes of their choices and can assign probabilities to their respective occurrence, participants in the BART typically know that a balloon can pop or be saved but are neither told nor can infer the exact probability of popping of a single balloon over

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the course of the experiment. In line with this assumption, Wallsten, Pleskac, and Lejuez (2005) showed that participants falsely believe the probability of popping to remain steady throughout a balloon (i.e., independent of the number of pumps so far). It is possible that our results would be different had we adopted a paradigm of decision-making under risk (e.g., the Columbia Card Task; Figner, Mackinlay, Wilkening, & Weber, 2009). It might be argued, for example, that deliberation might be useful in situations where we know the numbers and can calculate probabilities, but under uncertainty, simple rules of thumb may be better (Gigerenzer, 2014). As other research (Rahn et al., 2016) has shown, participants in a deliberative mindset seem to be fine-tuned for feasibility and desirability calculations (or probability and value in the case of decision-making under risk). Accordingly, choosing the BART in the present research may have favored risk-taking behavior in the implemental mindset condition and hindered it in the deliberative mindset condition.

Most importantly, because of its high external validity (e.g., Lejuez, Aklin, Zvolensky, et al., 2003), the observed mindset effects on risk taking in the BART speak for a general effect of the action phase in which people find themselves on risk taking in the real world. The present research shows that increased confidence (e.g., Gollwitzer & Kinney, 1989; Hügelschäfer & Achtziger, 2014) and increased optimism in an implemental mindset (e.g., Brandstätter et al., 2015; Puca, 2001) may carry over to increased risk taking when compared to participants in the deliberative mindset. This extends the scope of MAP by further validating the fine-tuning of implemental participants toward reaching their goals.

Pre- Versus Post-Decisional Deliberation

In our two studies, we found participants in a deliberative mindset to have more realistic risk perceptions and show more risk aversion in the BART. Nevertheless, MAP does not suggest that deliberation is always associated with risk aversion. In the present research, we asked participants to deliberate on a personal problem for which they have not made a decision yet on whether to act or to maintain the status quo. Research by Gagné and Lydon (2001) as well as Nenkov and Gollwitzer (2012) suggests that deliberation of decisions that have already been made has quite different consequences than deliberation of decisions that have not been made yet. For instance, Nenkov and Gollwitzer (2012) found that participants who deliberated on a goal which they had decided to pursue subsequently reported increased commitment compared to participants who deliberated on a goal which they were still undecided to pursue. This further translated into higher planning intensity and most importantly goal-directed behavior; participants who had to deliberate on an already made decision were three and a half times more likely to visit a website with goal-related information than participants who deliberated on a decision they had not made yet. What may be the consequences of deliberating on risk-related decisions that have already been made? If the decisions pertain to continuing a risky behavior or to not adopting a protective behavior, redeliberating such decisions may lead to even lower risk perceptions and more risk taking, instead of adopting more realistic risk perceptions (Experiment 1) and less risk-taking behavior (Experiment 2), as we have observed for participants in the deliberative mindset conditions. This mismatch between thinking about a decision that has not been made yet versus thinking about a decision that has already been made could also be responsible for the discrepancy between the observed effects of mindsets on illusory optimism (Taylor & Gollwitzer, 1995; Weinstein & Lyon, 1999). In the Weinstein and Lyon case, participants who were decided to adopt a protective behavior (i.e., get the household tested for radon exposure) perceived their risk to be even higher than participants who were undecided after getting new information on the subject. The critical test for our hypothesis, however, would have been to assess how these participants (i.e., the ones decided to test for radon) rated other, unrelated risks.

Conclusion

By validating the mindset effects on comparative illusory optimism and identifying downstream consequences of mindset induction on risk taking, the present research suggests that action-phase-related mindsets affect how individuals perceive and take risks. We observed that compared to individuals planning the implementation of a chosen project, participants weighing the pros and cons of making a decision exhibit more realistic risk perceptions and less risk-taking behavior, even when the task paradigm offers monetary incentives to engage in risk-taking behavior. This intra-individual difference should be kept in mind when it comes to communicating risks to risk-prone individuals as well as the general public.

Acknowledgments

The authors gratefully acknowledge the financial support from the German Research Foundation supporting the Research Initiative on "RISKDYNAMICS" at the University of Konstanz in their third funding line of the Excellence Initiative. The authors declare that they have no conflict of interest.

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at http://dx.doi.org/10.1027/1864-9335/a000304

ESM 1. Text and Table (PDF).
Original and translated materials (questionnaire) of the pilot study.

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Received August 26, 2016
Revision received March 14, 2017
Accepted March 14, 2017
Published online July 10, 2017

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