Mentales Simulieren: Eine effektive Methode zur Förderung von zielgerichtetem Verhalten

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Mentale Simulation:

Eine effektive Methode zur Förderung von zielgerichtetem Verhalten

Zusammenfassung der Dissertationsschrift

Die vorliegende Dissertation umfasst drei Teile. Zwei dieser Teile wurden in Form eines Artikels für eine englischsprachige psychologische Fachzeitschrift verfasst, und ein Teil in Form eines Buchkapitels für ein englischsprachiges psychologisches Fachbuch. Die zwei Artikel und das Buchkapitel beschäftigen sich mit einer Selbstregulationsstrategie zur Förderung der Zielerreichung, genannt mentale Simulation. Unter mentaler Simulation versteht man das Durchführen einer Visualisierung vor dem inneren Auge. Visualisiert werden können sowohl realitätsnahe, als auch fantasiereiche Inhalte, und die Visualisierung kann sich mit Dingen in der Vergangenheit, Gegenwart oder Zukunft beschäftigen. Untersucht wurden im Speziellen die zugrundeliegenden vermittelnden Mechanismen (kognitive Prozesse) einer mentalen Simulation. Artikel 1 befasst sich mit der Frage der Mediatoren der Förderung von zielgerichtem gesundheitsbezogenen Verhalten und diskutiert die Rolle der Schwierigkeit der gesetzten Gesundheitsziele. Artikel 2 vergleicht in 4 Studien die Selbstregulationsstrategie der mentalen Simulation mit der Strategie der Vorsatzbildung. Dabei werden Unterschiede in Bezug auf die durch Anwendung der beiden Strategien hervorgerufenen mindsets untersucht und das Aktivierungsniveau von in ihnen enthaltenen mentalen Konstrukten (zielfördernde Situationen und zielfördernde Verhaltensweisen) verglichen. Im dritten Teil dieser Dissertationsschrift, dem Buchkapitel, werden die gefundenen Unterschiede bezüglich zugrundeliegender vermittelnder Mechanismen von mentaler Simulation und Vorsatzbildung aufgezeigt und vor dem Hintergrund des Modells der Aktionsphasen diskutiert und mit neuer Forschung aus dem Bereich der Vorsatzbildung in Verbindung gesetzt.

Artikel 1: Mentales Simulieren und das Erreichen von Gesundheitszielen: Der Einfluss von Zielschwierigkeit

(Mental simulation and the achievement of health goals: The role of goal difficulty)

Die moderne psychologische Forschung im Bereich Motivation befasst sich mit verschiedenen Strategien zur Förderung von zielgerichtetem Verhalten. Eine dieser Strategien ist mentale Simulation. Darunter versteht man ein mentales Vorstellen von realen oder hypothetischen Ereignissen. Im Allgemeinen wird zwischen zwei Arten von mentaler Simulation unterschieden: Simulation des erwünschten Ergebnisses (Ergebnissimulation) und Simulation des Prozesses der Zielerreichung (Prozesssimulation). Bisherige Forschung hat gezeigt, dass sich das Durchführen einer mentalen Simulation – vor allem in Form von Simulation des Zielerreichungsprozesses - positiv auf die Zielerreichung auswirkt. Mentale Simulationen scheinen die Motivation zu erhöhen, Planungsschritte in Gang zu bringen, und beim Regulieren von Emotionen zu helfen.

In diesem Teil der vorliegenden Dissertation wurde gezeigt, dass mentale Simulation die Erreichung von gesundheitsbezogenen Zielen fördert. Universitätsstuden-ten wurden gebeten, sich ein leichtes oder schwieriges Gesundheitsziel (Beispiele leichter und schwieriger Gesundheitsziele wurden zur Verfügung gestellt) auszusuchen. Im Anschluss daran wurden die Versuchsteilnehmer entweder gebeten, sich das erwünschte Ergebnis (Ergebnisssimulation) oder den Prozess der Zielerreichung (Prozesssimulation) vorzustellen, oder sie wurden einer Kontrollbedingung zugeteilt. Versuchsteilnehmer in der Ergebnissimulationsbedingung stellten sich beispielsweise vor, dass sie 3 mal pro Woche Sport machen, während sich Versuchsteilnehmer in der Prozesssimulationsbedingung vorstellten, wie sie planen, 3 mal pro Woche Sport zu machen. Nach der Manipulation der drei Versuchsbedingungen füllten die Versuchsteilnehmer einen Fragebogen aus, der potentielle Mediatoren (Motivation, Planung, Self-efficacy, positive und negative Emotionen) erfasste. Alle Versuchsteilnehmer wurden dann gebeten, während dem Zeitraum von einer Woche an ihren Zielen zu arbeiten und jeden Tag aufzuschreiben, was sie für ihr Ziel getan haben. Nach einer Woche kehrten alle Versuchsteilnehmer ins Labor zurück, um ihre Notizen abzugeben. Die Ergebnisse ziegten, dass beide Arten der mentalen Simulation die Zielerreichung im Vergleich zur Kontrollgruppe erhöhten. Das Durchführen einer mentalen Simulation erwies sich dabei als besonders hilfreich bei schwierigen Gesundheitszielen. Die Ergebnisse zeigten auch, dass der positive Effekt der mentalen Simulation auf die Erreichung schwieriger Gesundheitsziele durch ein erhöhtes Ausmaß an Motivation hervorgerufen wurde.

Artikel 2: Mentale Simulation und Vorsatzbildung: Initiieren von unterschiedlichen Mindsets

(Mental simulation and implementation intentions: Initiating different mind-sets)

Wenn Menschen sich ein Ziel setzen, dann existieren meistens mehrere mögliche Wege zu diesem Ziel. Je nach Art des Zieles, ob mehr oder weniger komplex, existieren auch mehrere mögliche Strategien, die bei der Zielerreichung helfen können. Artikel 2 der vorliegenden Dissertation beschäftigt sich mit der Erforschung der zugrundeliegen-den vermittelnden Mechanismen zweier solcher Selbstregulationsstrategien der Förderung von zielgerichtetem Verhalten, genannt mentale Simulation und Vorsatzbildung. Während man sich beim Durchführen einer mentalen Simulation den Zielerreichungsprozess und das Ziel selbst vor dem inneren Auge vorstellt, entscheidet man bei der Vorsatzbildung, wann, wie, und wo man ein bestimmtes Zielverhalten ausführen möchte. Wenn man beispielsweise vorhat, regelmäßig Sport zu treiben, dann könnte man den folgenden Vorsatz fassen: Wenn ich Dienstag abend (wann) bei mir um die Ecke im Fitnessstudio bin (wo), dann trainiere ich konzentriert für 1,5 Stunden (wie). Die der Vorsatzbildung zugrundeliegenden vermittelnden Mechanismen wurden in bisheriger Forschung detailliert erforscht und erklärt. Die zugrundeliegenden vermittelnden Mechanismen der mentalen Simulation dagegen wurden bislang nur ansatzweise untersucht. In diesem Artikel werden 4 Studien vorgestellt, die sich mit dieser Frage beschäftigen und im besonderen Unterschiede zwischen mentaler Simulation und Vorsatzbildung hinsichtlich zugrundeliegender mindsets (Studie 1 und 2) und hinsichtlich Aktivierungsniveaus von relevanten mentalen Konzepten (Studie 3 und 4) untersuchen. Die Studien spiegeln dabei den Aufbau eines Vorsatzes (Wenn...., dann...) wider, indem eine Studie die zielrelevante Situation im Wenn-Teil und die andere das zielbezogene Verhalten im Dann-Teil untersucht. Die Manipulation der mentalen Simulation und Vorsatzbildung wurde in allen 4 Studien ähnlich erreicht: Die Versuchsteilnehmer wurden immer entweder der mentalen Simulationsbedingung oder der Vorsatzbildungsbedingung zugewiesen. Im ersten Fall wurden sie gebeten, sich vorzustellen, wie sie verschiedene Zielverhaltensweisen planen und ausführen; in der Vorsatzbildungsbedingung wurden sie gebeten, zu den vorgegebenen Zielen zu spezifizieren, wann, wo, und wie sie diese realisieren würden.

In Studie 1 und 2 konnte gezeigt werden, dass mentale Simulation und Vorsatzbildung unterschiedliche mindsets hervorrufen. Während das mindset in Verbindung mit mentaler Simulation Charakteristika eines deliberative mindset (open-minded Verarbeiten von Informationen) aufweist, ruft Vorsatzbildung eher ein implemental mindset hervor, das durch closed-minded Informationsverarbeitung gekennzeichnet ist. Die Studien 3 und 4 untersuchten Unterschiede in Aktivierungsniveaus von mentalen Konstrukten, die in einer mentalen Simulation und einem Vorsatz enthalten sind. Die Ergebnisse zeigen, dass die Vorsatzbildung zu einer höheren Aktivierung dieser mentalen Konstrukte im Vergleich zur mentalen Simulation führt.

Artikel 3: Mentale Repraesentationen und kognitive Prozesse der Wenn-Dann-Planung

(The Mental Representations and Cognitive Procedures of IF-THEN Planning)

Das Modell der Aktionsphasen beschreibt den Prozess der Zielerreichung als ein sukzessives Durchlaufen von vier verschiedenen Phasen. Ein Individuum beginnt in der pre-decisional Phase, durchläuft dann die pre-actional und actional Phase und endet mit der post-actional Phase. Jeder Phase liegt dabei ein anderes mindset zugrunde, das bei dem Lösen der entsprechenden Aufgabe auf dem Weg der Zielerreichung hilft.

Der dritte Teil dieser Dissertation beschäftigt sich mit den ersten beiden Phasen des Aktionsmodells und deren zugrundeliegenden mindsets und vergleicht die beiden im vorherigen bereits vorgestellten Selbstregulationsstrategien, mentale Simulation und Vorsatzbildung, hinsichtlich der ihnen zugrundeliegenden mindsets. Im ersten Teil des Buchkapitels werden, nach einer Revision der Forschung zum Aktionsphasenmodell und zu mindsets, die 4 Studien des Artikel 2 dieser Dissertation detailliert in bezug auf die Fragestellung der unterschiedlichen mindsets diskutiert. Als Ergebnis dieser Befunde und der Revision bisheriger Forschung wird eine Erweiterung der im Aktionsphasenmodell diskutierten mindsets vorgeschlagen. Bislang galt, dass ein deliberative mindset nur in der pre-decisional Phase vorkommt, aber die in Artikel 2 dieser Dissertation beschriebene Forschung zeigt, dass, je nach Anwendung der Strategie, ein deliberative mindset auch in der pre-actional Phase beobachtet werden kann (z.B. beim Durchführen einer mentalen Simulation). Im Speziellen wird vorgeschlagen, dass ein deliberative mindset bei der Erreichung komplexer Zielen auch in der pre-actional Phase hilfreich sein kann, um den besten Weg zum Ziel herauszufinden.

Im letzten Teil des Buchkapitels werden Befunde hinsichtlich der Aktivierungsniveaus von mentalen Konstrukten in mentaler Simulation versus

Vosatzbildung diskutiert und mit neueren Befunden aus der Vorsatzbildungsforschung verglichen. Eine mentale Simulation scheint zu einer gleichmäßigen Aktivierung aller in ihr enthaltenen mentalen Konstrukte zu führen. Die Vosatzbildung dagegen führt zu einer selektiven Aktivierung der mentalen Konstrukte, die zielrelevant sind und im Zentrum des jeweiligen Vorsatzes stehen.

Artikel 1: Mentales Simulieren und das Erreichen von Gesundheitszielen: Der Einfluss von Zielschwierigkeit

(Mental simulation and the achievement of health goals: The role of goal difficulty)

Abstract

The present study examined whether performing mental simulation fosters the achievement of personal health-related goals. College students were asked to choose either an easy or a difficult health goal. In addition, they were either assigned to a process simulation condition (simulating the steps to the goal), an outcome simulation condition (simulating the achievement of the goal), or to a passive control condition. Results indicated that both types of mental simulation enhanced the achievement of health-related goals, and proved especially effective at difficult goals. Given an easy goal, it did not make a difference if participants had performed mental simulations or not. The effect of mental simulation on the achievement of difficult health goals was mediated by enhanced motivation.

Introduction

Health goals are more and more "en vogue" in society, be it the increasing run on fitness institutions, dieting centers, and health food stores, or the increasing number of books and magazines that inform about the newest health diet or body-shaping program. On the other hand, statistics indicate that the need of changing health behaviors in society is still enormous: 26% of American adults smoke, 27% of the US population is obese, and approximately 40% of American adults do not engage in regular physical activity (US Department of Health and Human Services, 2000); half of the mortality rate is attributable to unhealthy behavior (Maes & Van Elderen, 1998). The need and interest is there, however, many people fail in achieving their particular health goals. What can be done to help people achieve their set goals?

Many authors of popular psychology stress the benefits of various cognitive strategies in order to make desired goals reality (e.g., Peale, 1982). Mental simulation, one of these strategies, refers to mentally imitating events, both real and hypothetical ones (Taylor & Schneider, 1989). Conceptually, two types of mental simulation can be distinguished (Taylor, Pham, Rivkin, & Armor, 1998). The first one focuses on the desired outcome itself and is labeled <u>outcome simulation</u>. The idea is that mentally simulating the successful achievement of the goal will help to bring it about. The second type of mental simulation is labeled <u>process simulation</u>. Despite the focus on the desired goal, process simulation suggests simulating the steps to the goal. The various activities that are necessary to achieve a certain outcome are envisioned and mentally elaborated. The aim of the present study was to extend the scope of the mental simulation construct by applying it to health-related goals. While research to date has examined the impact of mental simulation on exam performance (Pham & Taylor, 1999), on coping with stressful events (Rivkin & Taylor, 1999), on goal-directed performance (Taylor & Pham, 1999), and on the establishment of congruence between implicit motives and explicit goals (Schultheiss & Brunstein, 1999), no research has investigated the effects of mental simulation on the achievement of health-related goals. We hypothesized that participants who engaged in either outcome or process simulation would be more capable of achieving their health goals than participants who did not use mental simulation [1].

Studies comparing process and outcome simulation yielded mixed results. While some studies (Pham & Taylor, 1999; Rivkin & Taylor, 1999) suggested the superiority of process simulation over outcome simulation, others revealed that both enhance goal-directed activity to the same extent (Taylor & Pham, 1999). Hence, as a further aim we also attempted to distinguish empirically between process and outcome simulation.

How does mental simulation lead to more goal-directed activity? Mental simulation entails several characteristics that might enhance the link between thought and action. First, mental simulation augments the motivational states (Taylor & Pham, 1999) that might enhance actions toward the desired goals. Second, mental simulation facilitates planning the steps (Pham & Taylor, 1999; Rivkin & Taylor, 1999; Taylor & Schneider, 1989) that lead to the achievement of a goal. Third, it may increase perceptions of self-efficacy (Neck & Manz, 1996) that could yield superior performance. Fourth, mental simulation evokes emotional states (Neck & Manz, 1996), such as positive affect, which may facilitate action. Hence, a further aim of the present study was to examine potential mediators, including motivation, planning, self-efficacy, and affective states, by which mental simulation enhances the achievement of desired health goals.

The major purpose of this research, however, is concerned with testing whether mental simulation has the same effective and beneficial outcomes on easy and difficult goals. Gollwitzer and Brandstätter (1997) found that forming implementation intentions only facilitated goal completion of difficult goals; whereas findings regarding easy goals revealed no differences in the completion rate between participants who had and who had not formed implementation intentions. According to Gollwitzer and Brandstätter, the engagement in an easy goal seems to be more habitualized and, therefore, less affected by a facilitative technique. Based on this research, we predicted that the beneficial effects of mental simulation on goal achievement were limited to difficult goals; whereas mental simulation should neither increase nor diminish easy goal-directed activity.

The Present Study

Participants were first asked to specify a specific health goal that they wanted to achieve. Half of the participants specified a goal that was difficult to accomplish, while the remaining half specified a goal that was easy to accomplish. In the process simulation condition, participants mentally simulated themselves working toward the achievement of their health goal. In the outcome simulation condition, participants received the instruction to mentally simulate themselves having already achieved their health goal. In a control condition, no mental simulation was carried out. In the following week, participants were asked to employ a calendar to keep track of their behavior, which was related to their health goal. The content of the calendars was coded in order to obtain a score of the goal-accomplishment for each participant. Further, to explain possible differences among the experimental conditions, we also asked for potential mediators including motivation, planning, self-efficacy, and positive and negative affect.

Method

Participants and Experimental Design

Eighty-eight introductory psychology students at the University of California, Los Angeles (UCLA) participated in partial fulfillment of a research experience requirement. Seven participants who were almost equally distributed among the experimental conditions did not turn in their calendar sheets. Thus, the final sample consisted of 81 participants. The age of the participants ranged from 18 to 33 with a mean age of 20.34. Participants were run in groups of one to four. The groups were randomly assigned to one of the experimental conditions in a 3 (mental simulation: process vs. outcome vs. control) x 2 (task difficulty: easy vs. difficult) between-subjects factorial design.

Procedure and Materials

The experimenter introduced the study as an investigation of pursuing health goals. Participants were asked to specify either an easy or a difficult personal health goal, which they wanted to achieve during the following week. They were also asked to specify the exact amount of health behavior that they planned to achieve by exactly determining how often they wanted to engage in the goal-directed behavior. The following examples were provided: "In the coming week, I plan to exercise everyday", "I want to drink a medium coke less per day in the coming week", and "I will avoid all foods high in sugar and fat for the next 7 days." After that the simulation exercises were carried out. The participants listened with closed eyes to the following instructions read aloud by the experimenter (adapted from Pham & Taylor, 1999):

Process simulation. "Imagine the goal in the health domain that you just specified. Visualize yourself working toward the achievement of that goal. Picture yourself standing at the path that leads to your goal. Imagine how you work on your goal. Try to really see the path to your goal. How does it look like? Imagine how your life looks like on the path to your goal. What are the changes that you could make to it in order to get closer to your goal? How would a typical day look like on which you engage in your health behavior? Look at your life from your path. Imagine the changes that you could make in order to implement your health behavior into your daily life. Visualize the satisfaction you feel being in the middle of your process. Picture how good it feels to be on the way. Try to really feel how it is to be on the way. Feel how good it is. Think about your daily routine. Picture yourself deciding on which part of the day you could best implement your health behavior. Imagine such a day and visualize how you would implement your health behavior in it. See the path you are on. Picture exactly where you stand. Picture the work you are doing to achieve your goal. See the single parts of the process you are in. How does it feel to work on the accomplishment of your goal, to work on the change of your health behavior?"

Outcome simulation. "Think about the goal from the health domain that you just specified. Visualize yourself having already achieved that goal. Picture yourself having worked on the goal. You have put a lot of effort into the achievement of your goal and have finally accomplished it. Imagine the effort you have made. See yourself standing at the point of success from where you look back on the work you did to get there. Imagine how your life is different since you achieved your goal. Visualize the changes that resulted from the accomplishment of your goal. How does it feel to have implemented a behavior that is good for you into your daily life? Picture your life how it is now. Concentrate on the feelings that you have because you do something that is really good for you. Visualize the satisfaction you feel at having achieved your goal. Picture the pride you feel, the confidence you feel in yourself, knowing that you were successful with your goal. Try to really feel the satisfaction with the accomplishment of your goal. Feel how proud and confident you are. Think about your daily routine. What does your day look like, now that your health behavior is a firm part of it? Imagine a typical day and see yourself engaging in your health behavior. See yourself standing at the point of success. Picture yourself thinking back to when you started working on your goal. How do you feel having successfully accomplished what you wanted? Concentrate on the energy that your health behavior contributes to your life. How does it feel to have more energy and to know that you successfully engage in a behavior that is good for you?"

Control condition. Participants in the control group were not instructed in any exercise and immediately proceeded with answering the dependent measures.

Dependent Measures

As a manipulation check, participants were asked to rate the difficulty of their chosen health goal on a scale from 1 (very easy) to 7 (very difficult). To assess the potential mediators, all participants filled out a questionnaire measuring motivation, planning, self-efficacy, and positive and negative affect. Except of the measure for positive and negative affect, all items were derived from Pham and Taylor (1999) and were adapted in content to the present study. Assessments were made on an interval scale ranging from 1 (not at all) to 7 (extremely). Motivation was assessed through three items: "How motivated are you to achieve your goal?" "How motivated are you to put in effort to achieve your goal?", and "How motivated are you to invest a lot for your goal?" (Cronbach's alpha was .84). Planning was assessed by asking the following three items: "To what extent have you figured out exactly what steps you might take to achieve your goal?", "To what extent do you have a plan for how you can achieve your goal?", and "To what extent do you feel well prepared to achieve your goal?" (Cronbach's alpha was .67). Self-efficacy (Bandura, 1986) was assessed through asking participants "How confident are you to make the effort to achieve your goal?", "How confident are you to have the ability to achieve your goal?", and "How confident are you to be able to put in the energy needed to achieve your goal" (Cronbach's alpha was .79). Positive and negative affect was measured with a slightly adapted version of the Kammann and Flett (1983) questionnaire, consisting of 10 four-item subscales with two statements and two items that consist of a specific emotional adjective (e.g. "free-and-easy"). In the present study only the 20 affective adjectives were included as state measures for positive and negative affect. Cronbach's alphas for these two indexes were .81 and .85, respectively.

After the completion of the questionnaire, simulation participants were asked to practice the simulation exercise once a day until the follow-up one week later through reading the simulation script and producing the suggested images in their mind with their eyes closed. Participants in all conditions received a calendar sheet for the following week and were asked to specify each day what they did about their goal on that day.

One week later participants returned to the lab for the second session. They turned in their calendar sheets that indicated the amount of health behavior they had achieved during the last week. Participants were then thanked, thoroughly debriefed, and dismissed.

Two research assistants coded the behavior reported in the calendar sheets. For each day, a score of the degree of the goal-accomplishment was given to each participant. To give just two examples: If a participant wrote that the goal was to exercise everyday, then 100% was scored, if he/she did actually exercise everyday as reported in the calendar. If the goal was to drink a bottle of water four times a week, and the participant drank a bottle of water just twice a week, a score of 50% was given. Both raters were blind to the experimental hypotheses as well as to the simulation condition. Agreement among raters was very high ($r = .91$); disagreement was solved by discussion.

Results

Manipulation Check

Participants who pursued a difficult health goal rated their goal as being more difficult ($M = 5.11$) than participants who pursued an easy health goal ($M = 3.82$), $t(79) = 4.06$, $p < .001$. Hence, the experimental manipulation was successful.

Preliminary Analyses

Age and gender of participants were not related to any of the main dependent variables. Thus, these variables were not considered further. Inspection of the participants' health goals revealed that most of the goals described included the topic nutrition (46%), such as eating no or at least less sweets and dessert, eating more fruits and vegetables, drinking more water, or drinking less soda beverages. Thirty-five percent included the topic exercise, such as use the stairs instead of the elevator, go to the gym more often, whereas 18% included other topics, such as smoke less or sleep more. However, since there was no interaction between kind of health goal and the independent variables for any of the dependent variables, this variable is also not considered further.

Goal Achievement

There were no systematic differences between process and outcome simulation participants in achieving their goals. Thus, following the recommendations of Rosenthal and Rosnow (1985), planned contrasts were performed, comparing the simulation conditions (the process simulation condition and the outcome simulation condition) and the control condition. As shown in Table 1, participants in the simulation conditions (M = 78.7%, SD = 17.4) accomplished more of their health goals than participants in the control condition (M = 68.0%, SD = 26.5), $F(1, 76) = 4.76$, $p < .05$, $\eta^2 = .06$. Goal achievement did not differ dependent on goal difficulty, $F(1, 76) = 1.39$, $p = .24$, $\eta^2 = .02$. However, there was also a significant interaction between simulation condition and goal difficulty, $F(1, 76) = 2.85$, $p < .05$ (one-sided), $\eta^2 = .04$. Analysis of simple main effects revealed that simulation affected goal achievement only for difficult goals, $t(34) = 2.68$, $p < .05$, but not for easy goals, $t(42) = 0.36$, $p = .72$. Given a difficult goal, participants in the simulation conditions (M = 80.2%, SD = 16.3) were more successful in accomplishing their goals than participants in the control condition (M = 60.9%, SD = 26.7), whereas there were no differences between the simulation conditions (M = 77.6%, SD = 18.3) and the control condition (M = 75.2%, SD = 25.3) given an easy goal.

Potential Mediators

Table 2 shows the means of the potential mediators that were assessed in the present study - namely motivation, planning, self-efficacy, and positive and negative affect – for the simulation conditions and goal difficulty. No significant differences between outcome and process simulation occurred for any of the potential mediators. Thus, planned contrasts comparing the simulation conditions to the control condition were conducted for each of the potential mediators. Participants in the simulation conditions (M = 6.00, SD = 0.67) were significantly more motivated than participants in the control condition (M = 5.16, SD = 1.08), $F(1, 77) = 18.15$, $p < .001$, $\eta^2 = .19$. Further, participants who engaged in either process or outcome simulation (M = 5.64, SD = 0.75) reported using more planning than participants in the control condition (M = 5.04, SD = 1.16), $F(1, 77) = 7.10$, $p < .01$, $\eta^2 = .08$. Regarding self-efficacy, positive and negative affect, the main effects of simulation condition were, in contrast, not reliable, $F(1, 77) = 0.04$, $p = .84$, $\eta^2 = .00$; $F(1, 77) = 2.95$, $p = .09$, $\eta^2 = .04$; $F(1, 76) = 1.85$, $p = .18$, $\eta^2 = .02$, respectively. Regarding positive affect, there was, however, a significant interaction between simulation condition and positive affect, $F(1, 77) = 5.16$, $p < .05$, $\eta^2 = .06$. Whereas there were no differences given an easy goal, $t(42) = 0.40$, $p = .69$, simulation participants felt better (M = 5.00, SD = 0.71) than control participants (M = 4.23, SD = 0.98) given a difficult goal, $t(35) = 2.75$, $p < 01$.

Mediational Analysis

As documented, goal achievement was not differently affected by mental simulation given an easy goal, whereas given a difficult task, relative to the control condition, process and outcome simulation alike yielded a higher rate in goal achievement. Thus, we restricted our tests for mediators on the difficult tasks. According to Baron and Kenny (1986), three conditions must be met in order to establish mediation. First, the independent variable must be significantly associated with the dependent variable. Second, the independent variable must be significantly associated with the mediator. Third, in a multiple regression, if both the independent variable and the mediator are used to predict the dependent variable, the effect of the independent variable on the dependent variable must be substantially lowered (compared to regression 1), whereas the mediator must be still significantly associated with the dependent variable.

First, simulation condition (coded by 0 = control condition, 1 = simulation condition) was significantly associated with goal achievement, $\beta = .42$, $t(34) = 2.68$, $p < .02$. Second, simulation was significantly associated with motivation, $\beta = .46$, $t(34) = 3.05$, $p < .01$, and positive affect, $\beta = .42$, $t(35) = 2.75$, $p < .01$. In contrast, simulation was not significantly associated with planning, self-efficacy, and negative affect (note that this analysis is restricted to the difficult task conditions). Hence, the second condition was only met for motivation and positive affect. Finally, both simulation and motivation were used as predictors for goal-accomplishment. The overall regression was significant, $R^2 = .29$, $F(2, 33) = 6.75$, $p < .01$. The regression weight for motivation was significant, $\beta = .38$, $t(33) = 2.32$, $p < .03$, whereas the regression weight for simulation was substantially lowered and was no longer significant, $\beta = .25$, $t(33) = 1.51$, $p = .14$. Thus, mediation was shown for motivation. However, since β has not been reduced to zero, only partial mediation has been shown. In contrast, there was no mediation for positive affect. The overall regression was significant, $R^2 = .20$, $F(2, 33) = 4.12$, $p < .05$. However, the regression weight for simulation was still significant, $\beta = .35$, $t(33) = 2.11$, $p < .05$, whereas the regression weight for the mediator, positive affect, was not significant, $\beta = .17$, $t(33) = 1.02$, $p = .32$.

Discussion

Many popular psychologists suggest the benefits of imaginative concentration on desired goals in order to make them reality (e.g., Peale, 1982). Although the scientific credibility of such advice is often doubted, the results of the present study support the contention that performing mental simulation increases the rate of health goal-directed activity. Participants who either engaged in process or outcome simulation were more successful in achieving their personal goals, as reported in the calendars, than participants who did not did engage in any simulation exercise. In line with these results, previous studies have already shown that mental imagery is an effective motor performance enhancement technique (Ryan & Simons, 1981, 1982). Further, the employment of mental imagery has positive effects on employee cognitions, behaviors, and affects (Neck & Manz, 1996). Research has also revealed that mental simulation improved exam performance (Pham & Taylor, 1999), had beneficial effects on coping strategies (Rivkin & Taylor, 1999), and enhanced the quality of written essays (Taylor & Pham, 1999). In sum, it seems that the suggestion of many popular psychologists regarding the benefits of mentally imagining future events receives empirical support.

However, the present study revealed that the benefits of mental simulation on goal-directed activity were limited to goals that were difficult to accomplish. Participants who engaged in either process or outcome simulation were more successful in achieving their goals than participants of the control condition. In contrast, given an easy task, mental simulation did not enhance goal achievement. This finding ties in with the research by Gollwitzer and Brandstätter (1997) who showed that specifying implementation intentions affected only difficult goals, whereas there were no benefits of implementation intentions with easy goals. Inasmuch as it is more economical to abstain from imagining future events, mental simulation is not to be recommended in terms of an easy goal (mental simulation does not harm goal achievement, though).

Health goals often lack motivation to begin with (e.g. Gollwitzer & Oettingen, 1998), mostly due to the low incentives that accompany them (e.g., planning to go on a low fat diet does not seem very attractive). Furthermore, there are many compromising distractions and temptations (e.g., being invited to a dinner with friends while being on a diet) that have to be overcome. Not surprisingly, goals that are made with good intentions often end after a short period of trials, because people fail to act on them (Orbell & Sheeran, 1998). Accordingly, in the present study, mental simulation enhanced the achievement of the personal health goals by facilitating self-reported motivation, that is, the relation between mental simulation and goal-achievement was partially mediated by motivational states. There often seems to be a gap between people's intentions and their goal-directed activity. Mental simulation may help to close the gap between intentions and goal-directed action toward healthy behavior.

Limitations and Future Research

In the present study, there were no significant differences between the outcome and process simulation conditions for any of the dependent variables. One (unsatisfactory) explanation for this finding could be that the distinction between these two concepts is rather vague. For instance, how can one imagine a process without thinking about the outcome that the process is supposed to bring about? Accordingly, there was also some overlapping content in the process and outcome simulation instructions. Moreover, the control group did not engage in any exercise. Thus, it is conceivable that asking participants to engage in any goal-relevant exercise (rather than asking to engage in mental simulations per se) may lead to increased goal achievement. The instructions and the experimental procedure were adapted (and only slightly changed) from studies by Taylor and colleagues (Pham & Taylor, 1998; Rivkin & Taylor, 1999; Taylor & Pham, 1999; Taylor et al., 1998). Inasmuch as the main aim of the present study was to show that the effects of mental simulation on goal achievement are moderated by the difficulty of the goal, we closely employed their inductions. Nevertheless, future research is needed that provide a greater conceptual and operational distinction between the concepts of process and outcome simulation.

It should be also noted, the time frame of the present study was quite short. As such, it was not possible to investigate long-term effects of mentally rehearsing a health-related goal. Mental simulation seems to be a promising technique for the implementation of health goals. However, a long-term investigation is needed to determine the lasting effects of mental simulation on health behaviors. It might well be that participants returned to their former (undesired) habits soon after participation in the study. It would also be valuable to investigate the effects of mental simulation on health behaviors among other populations than College students, such as heavy smokers or people who are overweight, when goal-achievement is suggested from an outside source (e.g., a doctor prescribes a diet), and, thus, the goals to achieve are not self-concordant. Self-concordance refers to the extent to which an individual pursues a goal out of true personal interest as opposed to external or internal pressure (Sheldon & Elliot, 1998, 1999; Sheldon & Kasser, 1998) and is said to further goal achievement. Koestner and colleagues (Koestner, Lekes, Powers, & Chicoine, 2002) enhanced the level of self-concordance with a cognitive technique by asking participants to identify meaningful reasons why they pursued their goals, but they were not able to replicate this result in further studies. Inasmuch as mental simulations enhance the congruence between implicit motives and explicit goals (Schultheiss & Brunstein, 1999), performing mental simulations may be a more fruitful technique to influence self-concordance levels. Hence, future research on mental simulation might still be a promising endeavor.

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Footnote

1 The concept of mental simulation needs to be distinguished from the concept of positive fantasies (e.g., Oettingen & Mayer, 2002) and Kuhl's concept of state orientation (e.g., Kuhl, 1994). Positive fantasies involve the positivity of thoughts and images about the future. State orientated individuals are hesitating and ruminating. Both led to a failure of enactment of intentions. In contrast, mental simulations foster goal initiation.

Table 1

Means for Goal Achievement as a Function of Simulation Condition and Goal Difficulty

	Goal Difficulty	
Simulation Condition	Difficult	Easy
Process	84.2	77.6
Outcome	78.1	75.9
Control	61.4	77.5

Note. Ratings were made on a scale from 0 to 100%.

Table 2

Mean Ratings of Potential Mediators as a Function of Simulation Condition and Goal Difficulty

		Simulation Condition		
Potential Mediators	Goal Difficulty	Process	Outcome	Control
Motivation	Easy	6.02	5.79	5.27
	Difficult	5.90	6.36	5.02
Planning	Easy	6.00	5.60	5.00
	Difficult	5.67	5.44	4.86
Self-efficacy	Easy	5.86	5.96	6.09
	Difficult	5.93	6.05	5.76
Positive affect	Easy	4.94	5.03	5.11
	Difficult	5.22	4.93	4.20
Negative affect	Easy	2.24	2.20	2.45
	Difficult	1.57	2.10	2.33

Note. The scale for all variables was from 1 (not at all) to 7 (extremely).

Artikel 2: Mentale Simulation und Vorsatzbildung: Initiieren von unterschiedlichen Mindsets

(Mental simulation and implementation intentions: Initiating different mind-sets)

Abstract

Mental simulations and implementation intentions are two self-regulation techniques that further successful goal attainment. The present research examined whether the two mindsets associated with the two techniques differed regarding processing of information. The first two studies indicated that mental simulation induces a mindset associated with more open-minded processing of information, while implementation intentions induce a mindset associated with more closed-minded processing of information. The final two studies investigated activation levels of mental representations of mental simulation and implementation intention via a lexical decision task. Forming implementation intentions was found to result in heightened activation of both situational cues and behavioral responses compared to mental simulation. The implications of these findings are discussed on the basis of the model of action phases.

Introduction

A popular saying states that all roads lead to Rome. A saying that can well be applied to our everyday life, in which we usually have not only many different goals, but also many different roads to these goals. In the present research, we introduce four studies that compare the cognitive functioning of two distinct self-regulation techniques: mental simulation and implementation intentions. It is postulated that different mindsets are induced by them; one mindset facilitating "taking only one road to Rome" and the other one facilitating "taking several roads to Rome."

Imagine that you adopted the goal to lead a healthy lifestyle. There are many different ways to achieve such a higher-level goal. Some people may focus on exercising regularly as their best path to achieving this goal (taking only one specific road to Rome), others may have different approaches (taking various roads to Rome) and, depending on mood and opportunities, may choose the one or other approach, such as one day deciding to eat very healthy meals, and some other day preferring to accompany a colleague to the gym. Both approaches (focusing on one vs. focusing on several pathways) can be equally successful at goal attainment.

Mental Simulations

A great deal of empirical research suggests that mental simulations – a self-regulation technique - have beneficial effects on goal attainment. Taylor and Schneider (1989) define mental simulations as "imitative mental representations of some event or a series of events". The imagined events can both be real or hypothetical and the content of a mental simulation can range from wishful unrealistic fantasies about the future, over the rehearsal of likely future events to the going-over past events. Imagine again that your goal was to lead a healthy lifestyle. You might first mentally simulate how you exercise everyday and eat only healthy fruits and vegetables for lunch and dinner (a rather unrealistic fantasy), but then you start imagining that you go running twice a week and have a good share of fruits or vegetables at least once a day (a more likely future scenario). The effects of mental simulation have been found to promote the achievement of many different goals including performance goals, such as studying for an exam (Pham & Taylor, 1999) and preparing a presentation (Taylor & Pham, 1999), health-related goals (Greitemeyer & Würz, 2006), and goals related to coping with stressful events (Rivkin & Taylor, 1999). Furthermore, mental simulation has been shown to help establish congruence between implicit motives and explicit goals (Schultheiss & Brunstein, 1999), to increase assessed likelihoods of simulated events (e.g., Gregory, Cialdini, and Carpenter, 1982), to increase behavioral intentions towards advertised products (Escalas & Luce, 2003, 2004), and to motivate consumption behavior (Phillips, & Baumgartner, 2002).

Taylor, Pham, Rivkin, and Armor (1998) distinguish between two types of mental simulation that are especially relevant for self-regulation regarding goal-achievement: process vs. outcome simulation. In a process simulation, the step-by-step process of reaching a goal is imagined, whereas an outcome simulation focuses on the imagination of the desired outcome itself. To achieve the goal of leading a healthy lifestyle, a person in a process simulation would imagine the possible different steps that can lead to that goal and how to plan them, whereas in an outcome simulation the person would indulge in seeing himself or herself actually already leading a healthy lifestyle. Several studies have demonstrated that a process-focused simulation is more effective in changing behavior and promote performance than an outcome-focused simulation (Oettingen & Mayer, 2002; Pham & Taylor, 1999). For example, Pham and Taylor (1999) conducted a study comparing process and outcome simulation as means to enhance studying for an exam. One week before an actual exam, participants were either asked to visualize themselves studying for an exam in a way that would lead to their obtaining a grade 'A' (process simulation) or to visualize themselves achieving a grade 'A' on the exam (outcome simulation). Process simulation participants were shown to have spent more time for the exam and to have obtained significantly higher grades than outcome simulation participants.

Why do process-focused mental simulations benefit goal achievement? Thus far, only one psychological process was identified that explicates the effectiveness of process-focused mental simulation: planning. While mental simulations seem to enhance motivation for the achievement of a goal (Greitemeyer & Würz, in press; Taylor & Pham, 1999), to further self-efficacy towards being able to take the necessary actions to achieve a certain goal (Neck & Manz, 1996), and to help regulate emotional reactions (Pham & Taylor, 1999), only planning (Escalas & Luce, 2003, 2004; Rivkin & Taylor, 1999) was found to mediate the effects of mental simulation on the achievement of desired outcomes. Results from the consumer research domain, for example, demonstrate that process focused advertisements can facilitate behavioral intentions through the encouragement of formation of action plans (Escalas & Luce, 2003, 2004). Thus, process focused ('step-by-step') mental simulations seem to effect goal-achievement through action plan formation.

Implementation Intentions

In addition to mental simulation, there are other self-regulation techniques that lead to successful goal attainment, namely implementation intentions. Conceptually different from mental simulations, implementation intentions specify the when, where, and how of a goal-directed action and have the form of "*If* situation X is encountered, *then* I will perform the goal-directed response Y". Forming an implementation intention leads to commitment to perform the specified goal-directed response once the critical situation is encountered. Gollwitzer (1993, 1996, 1999) distinguishes implementation intentions from goal intentions, which specify an endpoint and have the form of "I intend to reach Z". Implementation intentions specify the situational context in which a goal-directed behavior will be enacted, as well as the goal-directed response itself, while goal intentions only specify what one wants to achieve. As such, implementation intentions can be seen as well-elaborated action plans in the service of goal intentions that maintain how a goal will be attained. Implementation intentions have been shown to increase goal-attainment rates of health goals, such as eating healthy foods (Verplanken & Faes, 1999), attending cervical cancer screening (Sheeran & Orbell, 2000), performing breast self-examinations (Orbell, Hodgkins, & Sheeran, 1997), or engaging in physical exercise (Milne, Orbell, & Sheeran, 2002), but also to help prevent ego-depletion (Webb & Sheeran, 2003), to help control unwanted prejudicial responses (e.g., Achtziger, Halller, & Gollwitzer, under review), and to promote behavior change (e.g., Bamberg, 2000). Results from two meta-analyses suggest that forming implementation intentions has a medium-to-large effect (ranging from d = .54 to d = .65) on successful progress at goals (Gollwitzer & Sheeran, in press; Koestner et al., 2002).

Why do implementation intentions facilitate goal attainment? Gollwitzer et al. (2005) suggest two psychological processes that relate to both the anticipated situation (the *if*-component of an implementation intention) and the goal-directed response (the *then*-component of an implementation intention). The first psychological process postulates that specifying implementation intentions involves choosing among various possible situations the one that seems most suitable and ripe for action (anticipated situation) leading to a heightened activation of the mental representation of the situation which then becomes more accessible. In fact, several studies demonstrated that the heightened accessibility facilitates attention to, and detection and recall of critical situational cues (Aarts, Dijksterhuis, & Midden, 1999; Gollwitzer, Bayer, Steller, & Bargh, 2002; Seehausen, Bayer, & Gollwitzer, 1994; Steller, 1992). For example, Aarts et al. (1999) observed faster lexical decision times for words that described situational cues specified in implementation intentions. Implementation intention effects were mediated by faster lexical decision times to these critical words. Faude (2006) further demonstrated that the formation of implementation intentions not only enhances the accessibility of the anticipated situation, but also of the goal-directed response, observing faster response latencies for behavior-words after implementation intention formation.

The second postulated psychological process states that forming an implementation intention creates a mental link between the anticipated situation and the specified response. For instance, a possible link in the service of the goal intention to lead a healthy lifestyle would link a goal-directed response (e.g., exercising regularly) to a suitable situational context (e.g., at the gym). This link between the anticipated situation, the if-component, and the specified response, the then-component, leads to the specified response being initiated immediately (tested by means of response latencies and by the temporal proximity of actual performance to the time of performance specified in the implementation intention; e.g., Brandstätter, Lengfelder & Gollwitzer, 2001; Gollwitzer & Brandstätter, 1997, Study 3; Oettingen, Hönig, & Gollwitzer, 2000), without conscious intent (Bayer, Moskowitz, & Gollwitzer, 2004; Sheeran, Webb, & Gollwitzer, 2005), and efficiently (tested by means of variation of cognitive load; e.g., Brandstätter, Lengfelder, & Gollwitzer, 2001, Studies 3 and 4; Lengfelder & Gollwitzer, 2001) once the critical situation is encountered. Thus, action control through formation of implementation intentions shows features of automaticity (Bargh, 1992, 1994). For example, Brandstätter et al. (2001, Studies 3 and 4) had participants either form the goal intention to press a button as fast as possible if numbers appear on the computer screen, but not if letters were presented or form the implementation intention to press a button particularly fast if the number three appeared. A substantial increase in speed of responding to the number three could be demonstrated for implementation intentions compared to the goal intention group. Another study (Gollwitzer, Bayer, Steller, & Bargh, 2002), using a dichotic-listening paradigm, demonstrated that implementation intention participants' focused attention was highly interrupted by words that described the anticipated critical situation while no such effect appeared for goal intention participants. The role of the mental link between an anticipated situation and a specified response on action control was investigated in a study by Webb and Sheeran (2006). Participants were asked to either form the implementation intention to press a key especially quickly if they saw the non-word "avenda" or to try to react as quickly as possible by familiarizing themselves with the non-word "avenda". A lexical decision task was then performed that contained the subliminal presentation of a prime word. Results indicated that implementation intention participants showed faster lexical decision times to the word describing the critical situational cue and to the word describing the specified response when they were preceded by the subliminally primed cue word compared to control participants but there was no difference between the groups when those words were preceded by neutral primes. In sum, the processes underlying the beneficial effects of implementation intentions on goal-achievement are well documented.

Mindsets and the Model of Action Phases

The model of action phases (Gollwitzer, 1990; Heckhausen, 1991; Heckhausen & Gollwitzer, 1987) construes goal pursuit in terms of four different consecutive action phases: the predecisional phase, the preactional phase, the actional phase, and the postactional phase. In every phase, individuals have to solve a different task. In the first, predecisional phase, they have to make the best possible choice between different wishes they entertain, because people cannot act on all of their wishes at once. After giving one of the wishes the highest preference, individuals are ready to make a commitment to realize this wish (i.e., form a goal intention), and thus move on to the next phase. The main task in the preactional phase is to plan the implementation of the chosen goal. Individuals in this phase address questions of *when* and *where* to start acting, *how* to act, and *how long* to act. The subsequent actional phase is marked by action initiation, where individuals finally engage in goal-directed activities to achieve their wanted outcome. Finally, in the postactional phase, individuals have to solve the final task of evaluating the success of goal-attainment.

The model of action phases implies that undertaking the four distinct tasks described above activate congruent *mindset* (i.e., phase-typical cognitive procedures that benefit successful task completion (Gollwitzer, 1990). So far, a body of research has explored the cognitive features of deliberative and implemental mindsets; that is, differences in cognitive processes when an individual is choosing a goal as compared to planning the attainment of a goal.

Research on information processing suggests that there are differences between deliberative and implemental mindsets regarding the way individuals process information. Specifically, individuals in a deliberative mindset analyze information more impartially, while individuals in an implemental mind-set tend to analyze information in a more partial way (Amor & Taylor, 2003; Gagne & Lydon, 2001; Gollwitzer & Kinney, 1989; Taylor & Gollwitzer, 1995). Further, several studies have demonstrated that individuals in a deliberative mindset, as they have to make a goal decision, should be particularly open to any available information that might help them with the decision-making process (referred to as "general open-mindedness to information"). Because it is initially unclear which pieces of information are particularly relevant to the decision to be made, it is beneficial to approach information with a general open-mindedness. In contrast, individuals in an implemental mindset process information more selectively, focusing on goal-relevant stimuli, while ignoring goal-irrelevant stimuli. As a result, a deliberative mindset is associated with open-mindedness to information and an implemental mindset with more closed-minded processing of information.

The suggested differences in open-mindedness between deliberative and implemental mindsets have recently been investigated by Fujita, Gollwitzer, and Oettingen (2007). In three studies, participants in deliberative and implemental mindsets had to perform a computerized concentration test. Randomly during the test, participants were presented with semantically unrelated incidental words (e.g., bone, every, flag, always). After working on a questionnaire ostensibly unrelated to the tasks, participants were asked to perform a surprise computerized recognition memory test, containing the initially presented incidental words. In all three experiments, participants in a deliberative mindset demonstrated superior recognition memory compared to participants in an implemental mindset. These results provide evidence that deliberative mindsets are marked by more open-minded processing of information, whereas implemental mindsets are characterized by more closed-minded processing.

How do these differences in processing of information of deliberative versus implemental mindsets apply to mental simulation and implementation intentions?

We postulate that performing mental simulations activates a deliberative mindset associated with more open-minded processing of information. Empirical support for this assumption is provided by research on hindsight bias and counterfactual priming, which suggests that inducing a mental simulation mindset results in generating and considering additional alternatives (Hirt & Markmann, 1995; Hirt, Kardes & Markmann, 2004; Kahnemann & Tversky, 1982). On the other hand, several studies have demonstrated that forming implementation intentions tunes individuals' thoughts into the when, where, and how of goal implementation, a feature described in an implemental mindset (Fujita, Gollwitzer, & Oettingen, 2007; Gollwitzer & Bayer, 1999; Taylor & Gollwitzer, 1995). Further, deliberative mindsets are associated with greater openness to different sources and types of information (Fujita, Gollwitzer, & Oettingen, 2007), whereas an implemental mindset is associated with filtering of information and selective processing of stimuli (e.g., Gollwitzer, 1990; Kuhl, 1984).

The present studies

The present studies were designed to test whether mental simulations indeed lead to a mindset associated with a more open-minded processing of information, whereas implementation intentions lead to a mindset that involves a more closed-minded processing of information. A second aim was to compare activation levels of underlying mental representations of mental simulation and implementation intentions.

In order to measure breadth of information processing (Study 1 and 2), we asked participants to generate alternatives to situational opportunities and goal-directed responses. The structure of an if-then plan was reflected in the studies, such that the first study targeted the anticipated situation specified in the if-component of the implementation intention, and the second study targeted the critical response specified in the then-component. In the second study we further included a cognitive load condition to replicate previous findings showing that implementation intentions operate efficiently (e.g., Brandstätter et al., Study 2 and 3), and to explore the effect of cognitive load on mental simulation. In both studies, we also measured the time of stimulus onset to the moment when participants first pressed a key on the keyboard. Hence, our main dependent variables in the first two studies consisted of the mean number of generated alternatives to presented stimuli and mean reaction times.

To compare activation of mental representations of mental simulation and implementation intentions (Study 3 and 4), a lexical decision task was used. Specifically, activation of the mental representation of critical situational stimuli (Study 3) and goal-directed responses (Study 4) when mentally simulating or forming if-then plans was compared. In both studies, assigned implementation intentions and mental simulations were used to ensure that the observed heightened accessibility was not meddled by mere semantic relatedness between words.

Study 1

Method. Forty-three undergraduate students from an American University were given the goal to do well at school. About half of the participants were then asked to listen to a tape-recorded mental simulation describing three different situations related to the goal (i.e., reading a *textbook* and marking passages in it with a *highlighter*, taking notes on a *notepad* in a *lecture*, writing an essay on a *laptop*). Thus, the three different situations participants had to listen to and visualize, contained a total of five critical study possibilities (i.e., highlighter, textbook, notepad, laptop, lecture). Participants were instructed to visualize the described situations as vividly as possible. The other half of the participants was asked to adopt five implementation intentions in the service of the adopted goal. The if-then plans contained the same five study possibilities described above as element of the if-part of the plans (e.g., "If I sit in front of my *textbook*, then I will read every passage very carefully"). Finally, participants in the mental simulation and implementation intention condition were seated in front of a computer and presented with the five study possibilities. For each stimulus, they were asked to come up with as many alternatives as possible during a time period of 3 minutes and to type these alternatives in the keyboard (e.g. if "textbook" was presented, participants could write "article, paper, PowerPoint presentation" etc). At the same time, we measured the time of stimulus onset (i.e., the presentation of the study possibilities on the computer screen) to the moment when participants first pressed a key on the keyboard to start writing down alternatives.

Results. First, participants who had not complied with the instructions and had written answers that were unrelated to the experiment were excluded from the analysis (N = 5), resulting in a total of 38 participants that were included in the main analysis. Then, two independent raters who were unaware of the hypotheses under investigation counted responses of participants to the three different stimuli with regard to the number of generated possible alternatives. The numbers were then averaged across the three stimuli to provide an index for the number of overall generated alternatives. Interrater agreement was high (r = .91). Next, participants' responses to the five critical stimuli were averaged to provide an overall index of generated possible alternatives and subjected to a one-factorial (technique: mental simulation vs. implementation intentions) ANOVA controlling for speed of typing.

A significant main effect for technique emerged, $F(1, 37) = 5.64$, $p < .05$. Participants who performed mental simulations generated more possible alternatives ($M = 7.4$, $SD = 2.5$) than did implementation intentions participants ($M = 5.7$, $SD = 1.8$). The reaction times to the five stimuli were also averaged to provide an overall index of how fast participants started writing down alternatives. On this measure, a significant main effect for technique was found: As expected, implementation intentions participants started faster with this task after stimulus presentation ($M = 2586$, $SD = 792$) than did mental simulation participants ($M = 3344$, $SD = 1077$), $F(1, 37) = 6.42$, $p < .05$.

The results indicated that mental simulation participants created more possible alternatives for the presented situational cues than implementation intention participants. However, implementation intention participants started faster with writing down alternatives to the situational cues (i.e., they pressed a key on the keyboard faster after presentation if situational cues) than did mental simulation participants. We draw two conclusions based on these results. First, the mindset induced by mental simulation seems to enhance open-mindedness in the sense of having it easy to generate alternatives to presented situational cues. On the other hand, forming if-then plans seems to lead to a more closed-minded processing of information, as indicated by producing fewer alternatives. Second, we observed that if-then plans not only lead to an overall more narrow focus, but also lead to a stronger focus on the situation specified before-hand, indicated by faster reaction times to presented material when starting to write down alternatives by implementation intention participants. Taken together, these results suggest that mental simulation seems to create an exploratory mindset with associated open-mindedness, while if-then plans lead to a mindset with a more closed-minded focus on the situations specified in the if-part of the implementation intentions.

Study 2

The second study targeted the *then*-component of an implementation intention. Besides replicating the previous results, we wanted to demonstrate that mental simulation leads to finding more possible alternative goal-directed actions. We also made some changes to the design in order to exclude some possible alternative explanations. First of all, we let mental simulation participants simulate freely (without a guided visualization) and we let implementation intentions participants choose their own plans, rather than having them learn a plan that did not originate from themselves as in Study 1. The advantage of mental simulation might have been due to the fact that implementation intentions participants could not choose their own personal implementation intentions and, therefore, might have been less motivated to work on the task. Furthermore, we included cognitive load to explore whether mental simulation would be affected by cognitive load. Finally, we gave participants three minutes to come up with possible alternatives. The design of Study 2, therefore, resulted in a 2 (self-regulation technique: mental simulation vs. implementation intentions) x 2 (cognitive load: yes vs. no) factorial design.

Method. All participants (N = 102) were recruited at a German University and participated in this study as part of a course requirement. Upon their arrival at the lab, they were assigned to one of four experimental conditions. All participants were first given the goal to study effectively for an upcoming exam. Next, participants were presented with the manipulation of the self-regulation techniques: One half of participants was instructed to mentally simulate the process of studying for an exam, and the other half of participants was asked to specify implementation intentions related to studying for an exam. Specifically, mental simulation participants were asked to visualize three different situations of studying for an exam. They were provided with three different examples related to studying for an exam: reading a textbook, memorizing lecture materials, summarizing passages of a textbook. Mental simulation participants were asked to choose three study situations that were most typical for them and to visualize each of the situations for at least three minutes. Next, they had to briefly write down what they had visualized. For instance, a mental simulation participant wrote the following: "I see myself sitting at my desk at home reading my textbook. Then, I start summarizing important passages in it."

Accordingly, implementation intention participants were presented with the same three examples of studying as mental simulation participants and were asked to form three implementation intentions related to the goal. For instance, participants specified the following implementation intention: "If I sit at my desk, then I will *read* my textbook." After the experimental manipulation, participants had to fill out several questionnaires measuring potential mediators. At the same time, the experimenter prepared the individualized computer task by selecting three situational cues related to studying (e.g., textbook, desk, lecture) from participants' materials. Next, participants were seated in front of a computer and presented with these three situational cues. As in the previous study, they were asked to come up with as many ways of how the situational cues could be used for studying as possible. If *textbook* was presented to a participant, for example, the participant wrote down on the keyboard "reading, summarizing, underlining", i.e. all different kinds of behaviors related to studying that one could perform with a textbook. Again, we measured the time of stimulus onset to the moment when participants first pressed a key on the keyboard to start writing down behavior words. Additionally, cognitive load was manipulated by presenting consonants and vowels to half of the participants over headphones and asking them to count the vowels (manipulation for cognitive load suggested by Ditto et al., 1998) while working on the computer task.

Results. As in Study 1, participants who had not complied with the instructions ($N = 4$) were excluded from the analysis. Again, two independent raters counted participants' generated action words. These numbers were then averaged across the three stimuli to provide an index for the number of overall generated action words. Interrater agreement was very high ($r = .97$). The averaged index of generated words was subjected to a 2 (technique: mental simulation vs. implementation intentions) x 2 (cognitive load: yes vs. no) x 2 (order: mental simulation self-generated vs. implementation intentions self-generated) ANOVA. Speed of typing was again statistically controlled for. The analysis indicated a significant main effect for self-regulation technique, $F(1, 98) = 9.56$, $p < .01$. Mental simulation participants generated more action words related to studying ($M = 12.8$, $SD = 4.3$) than implementation intentions participants ($M = 10.7$, $SD = 2.8$). This effect was further qualified by a marginally significant interaction between self-regulation technique and cognitive load, $F(1, 98) = 2.26$, $p = .07$ (one-sided). Follow-up test revealed that in the no load condition mental simulation participants ($M = 12.9$, $SD = 5.2$) and implementation intentions participants ($M = 11.8$, $SD = 3.1$) did not differ significantly with regard to the number of generated action words, $t(49) = 0.91$, $p = .37$. However, under cognitive load mental simulation participants ($M = 12.7$, $SD = 3.2$) generated significantly more action words compared to implementation intentions participants ($M = 9.5$, $SD = 2.0$), $t(50) = 3.18$, $p < .01$. The results are depicted in Table 1.

In order to provide an index for the overall response latencies, the three response latencies over the three stimulus words were averaged and then subjected to a 2 (self-regulatory technique: mental simulation vs. implementation intentions) x 2 (cognitive load: yes vs. no) ANOVA. The analysis yielded a significant main effect for self-regulation technique, $F(1, 96) = 6.30$, $p < .05$. Implementation intentions participants started faster with writing down action words to presented situational cues (*M* = 2398, *SD* = 1060) than mental simulation participants (*M* = 2994, *SD* = 1350).

In sum then, mental simulation participants generated more possible action words related to presented situational cues (i.e., the cues that were selected from the individual mental simulations or implementation intentions) than implementation intention participants. However, this effect was affected by the cognitive load manipulation: While mental simulation participants generated a higher number of action words than implementation intention participants under cognitive load, both groups performed equally well in the no load condition. We take this finding to mean that the open-mindedness activated by mental simulations seems to be unaffected by depletion of resources. The activated closed-mindedness by performing implementation intentions, on the other hand, seems to have been affected by the load manipulation, as indicated by the generation of more alternatives under no load than under load by implementation intention participants. In other words, closed-mindedness is increased by cognitive load. As in the before reported results, if-then plan participants responded faster to presented stimuli than mental simulation participants, with no differences observed among participants who were put under cognitive load and those under no-cognitive load. This finding is in line with research demonstrating that the formation of if-then plans leads to the automatic elicitation of goal-directed responses (e.g., Gollwitzer & Brandstätter, 1997; Bayer, et al., 2004).

Remember that implementation intentions participants responded faster to presented material (situational cues in Study 1 and goal-directed actions in Study 2) in both hitherto reported studies. We take this finding as evidence of a stronger focus on previously specified means when forming implementation intentions as compared to performing mental simulation. This finding also hints at basic cognitive processes (i.e., activation levels of mental representations) underlying the two different mindsets associated with implementation intentions (implemental mindset) and mental simulation (deliberative mindset). To address this question, we designed two further studies that enabled us to measure activation levels of mental representations of implementation intentions vs. mental simulations.

Specifically, in the next study, we compared activation of the mental representation of critical situational stimuli when performing mental simulations versus forming implementation intentions. To this end we used a lexical decision task, as indirect measures have become the norm to measure construct activation (e.g., Kruglanski et al., 2002; Marsh & Landau, 1995; Shah & Kruglanski, 2000).

Study 3

Study 3 focused on the if-component of an implementation intention, assessing the mental representation of the specified situation and used assigned (vs. self-generated) mental simulations and implementation intentions to ensure that heightened accessibility would not be muddled by semantic relatedness between words.

Method. In order to test our hypothesis, we had all participants ($N = 67$) adopt the goal to do well in school. The participants were undergraduate students at an American university who participated in the study as part of a course requirement. After adopting the goal, half the participants were assigned to the mental simulation condition and asked to listen to a tape-recorded mental simulation, describing three scenarios beneficial to the given goal (i.e., highlighting important passages in a textbook with a highlighter, writing an essay on a laptop, writing notes on a notepad during class). Hence, the mental simulation contained a total of five critical situational cues (i.e., textbook, highlighter, laptop, essay, notepad). The other half of participants was assigned to the implementation intention condition and asked to adopt two implementation intentions related to the goal. Each implementation intention contained one of the five situational cues mentioned above (e.g., "If I have a *highlighter* in my hand, then I will underline important passages in my lecture materials"). The remaining situational cues (i.e., the situational cues that were not contained in their implementation intentions) were presented to implementation intentions participants through a "spelling test". The test contained the three situational cues plus misspelled words and participants were asked to correct any misspelled words. This was done to ensure equal exposure to the stimuli across conditions.

Finally, all participants were seated in front of a computer. Participants were told that they would now continue with another ostensibly unrelated task that was introduced as a task on lexical judgments. They were told that letter strings would appear on the screen and that they had to respond "yes" (by pressing one key on the computer's keyboard) if the presented letter string was a legal English word and "no" (by pressing another key) if it was not. They were also instructed to react as fast and as accurately as possible. After ten "warm up" presentations, participants completed twenty trials that contained the five situational cues (i.e., textbook, highlighter, laptop, essay, notepad), five neutral words that were matched in length and word frequency, and ten nonwords. In each trial a fixation cross first appeared for 750ms in the middle of the screen, which was immediately followed by the letter string. The letter string disappeared when the participant responded and the next trial began. Response latencies were measured in milliseconds (ms) from the time of the stimulus onset (presentation of letter string) until the participant's response. The order of appearance of the letter strings was randomized across participants. After the lexical decision task, participants were thoroughly debriefed and thanked for their participation.

Results. To remove participants' outlying responses and not to loose too many data points, we chose to trim response latencies to within three standard deviations of each participant's main response latency. Response latencies based on errors (i.e., subject pressed the "word" key when presented with a non-word) were also removed from the analysis, because the speed of participants' incorrect responses cannot be explained in terms of accessibility (see Bargh, Chaiken, Govender & Pratto, 1992). Response latencies were collapsed across the situational cues, neutral words, and nonwords, and a 2-between (self-regulation technique: mental simulation vs. implementation intentions) x 3-within (word type: situation word vs. neutral word vs. nonword) repeated measures ANOVA was conducted to ensure that there were no differences between the two experimental conditions in response to situational cues, neutral words, and nonwords. Whereas a main effect of word type emerged, $F(2, 65) = 75.02$, $p < .01$, demonstrating that participants reacted significantly faster to situational cues ($M = 590$, $SD = 102.1$) than to neutral words ($M = 648.1$, $SD = 109.5$) and nonwords ($M = 750.8$, $SD = 153.5$), the interaction between word type and self-regulation technique was not significant, $F(2, 65) = 2.05$, $p = .14$.

Next, we calculated the difference scores between situational cues and matched neutral words to measure participants' accessibility of these words. The scored were then averaged to form the main dependent variable and subjected to a one-factorial (self-regulation technique: mental simulation vs. implementation intentions) ANOVA. As expected, difference scores were significantly higher for implementation intention participants ($M = 99$, $SD = 140.1$) than for mental simulation participants ($M = 3.1$, $SD = 81.1$), $t(65) = -3.50$, $p < .01$. Then, a repeated measures ANOVA was performed with implementation intention participants only, comparing the averaged difference score of the two situational cues contained in the implementation intention with the averaged difference score of the three situational cues presented to participants in the "spelling test". The ANOVA yielded a main effect for word type: The difference score of situational cues contained in the implementation intentions was marginally significantly higher ($M = 99.00$, $SD = 140.10$) compared to the situational cues contained in the "spelling test" ($M = 51.95$, $SD = 78.48$), $F(1, 37) = 3.22$, $p = .08$.

Hence, the lexical decision task yielded a higher differences score for critical situational cues for implementation intention participants than for mental simulation. This result indicates that forming implementation intentions leads to higher activation levels for the situation-words than mentally simulating. The results are in line with previous findings of implementation intention formation that suggest heightened accessibility of the specified situation (Faude, 2006; Gollwitzer, 1993, 1996).

Additional analyses demonstrated that among implementation intention participants, only those situation-words that were part of an implementation intention showed higher activation levels, but not the situation-words that were presented in the "spelling test." Mental simulation participants, on the other hand, demonstrated equal activation levels for all five situation-words, but their overall activation levels were lower than those of implementation intention participants. Thus, implementation intention participants seemed to focus on the two situational cues contained in their implementation intentions, while mental simulation participants focused on all five situation words equally strong.

Recent research supports the idea that goal-directed responses are mentally represented and activated (Aarts & Dijksterhuis, 2000a, b; Faude, 2006). For instance, Aarts and Dijksterhuis (2000a, b) found that habit related action words were highly activated, as demonstrated through a lexical decision task. In the case of implementation intentions, only one study thus far investigated the construct activation of the goal-directed behavior specified in the then-component, observing that the goal-directed response specified in an implementation intention is highly activated (Faude, 2006). No research has been conducted investigating this activation aspect with regard to mental simulation.

The aim of our final study was many-fold. First, we wanted to replicate previous findings demonstrating higher activation of goal-directed responses through forming implementation intentions. Second, we wanted to replicate findings of our previous study and compare the activation of the mental representation of goal-directed responses when mentally simulating or forming implementation intentions. Third, we wanted to investigate the strength of mental links between mental representations of situational cues and respective goal-directed responses in mental simulations and implementation intentions. Webb and Sheeran (2006), for example, found that effects of implementation intentions were mediated by the strength of cue-response links.

It was predicted that forming an implementation intention would lead to higher activation levels of goal-directed responses compared to mental simulation. Furthermore, activation levels of goal-directed responses when forming an implementation intention are expected to be particularly strong when the goal-directed response is primed with the respective situational cue.

Study 4

Study 4 targeted the *then*-component of an implementation intention, assessing the mental representation of the goal-directed response and also used assigned mental simulations and implementation intentions.

Method. Sixty-nine undergraduate students at an American university participated in this study for partial course credit. Participants were randomly assigned to one of four conditions (mental simulation with relevant prime, mental simulation with irrelevant prime, implementation intention with relevant prime, implementation intention with irrelevant prime). Upon arrival at the laboratory, participants were told that the experiment would entail several unrelated tasks. First, participants were asked to adopt the goal “to lead a healthy life-style”. Next, one half of the participants was asked to listen to a tape-recorded mental simulation describing three different goal-directed actions related to the goal (i.e., climbing the stairs, cooking a healthy meal, exercising in the gym). The other half of the participants had to adopt three implementation intentions containing the three goal-directed actions of the mental simulation in the then-part of the plan (i.e., “If I enter a multi-story building, then I will climb the stairs instead of taking the elevator”, “If I have a friend over for dinner, then I will cook a healthy meal that includes vegetables”, “If I am on campus and have some free time, then I will go exercise at the gym”).

All participants were then told that the next involved word-related judgments and was unrelated to the prior task. Participants were seated in front of a computer and asked to perform a lexical decision task. Each stimulus presentation was preceded by a subliminal presentation of a prime word. The lexical decision again comprised three types of words: three critical action words (cook, climb, exercise), three matched neutral words (coat, cease, estimate), and six nonwords. The critical action words and neutral words were tested for semantic relatedness prior to running the experiment. To this end, university students (N = 12) were asked to generate associations to action words and neutral words. As a result, one of the preselected neutral words was excluded and replaced by another semantically unrelated neutral word.

In addition, one half participants was subliminally primed with situational cues related to the action words (building, campus, friend) and the other half was primed with irrelevant words (chapel, standard, method) during the lexical decision task. The prime words were presented sufficiently quickly so that they were outside participants' awareness. This allowed for comparison of the strength of association between a relevant prime and a target response (e.g., building – climb) to the strength of association between an irrelevant prime and the same response (e.g., standard – climb) after mentally simulating or forming implementation intentions. After the computer task, participants were asked to fill out a questionnaire that measured their commitment to follow a healthy life-style, positive and negative affect, and how often they usually cook a healthy meal, climb the stairs, and exercise in their daily life.

Results. Response latencies that lay outside of three standard deviations and error responses were excluded from the analysis. The trimming process resulted in the exclusion of 0.3% of the responses. The three response latencies of the three critical action words were averaged to form the main dependent variable. First, a 2-between (self-regulation technique: mental simulation vs. implementation intentions) x 3-within (word type: target vs. neutral vs. nonwords) ANOVA was conducted. A significant main effect of word type was observed, $F(2, 85) = 30.32$, $p < .01$, demonstrating that participants reacted significantly faster to critical action words (*M* = 617, *SD* = 110) than to neutral words (*M* = 694, *SD* = 150) and nonwords (*M* = 820, *SD* = 151). Then, a 2-between (experimental condition: mental simulation vs. implementation intentions) x 2-between (prime: relevant vs. irrelevant) x 2-within (word type: target vs. neutral) ANOVA was conducted. Results revealed a marginally significant word type x experimental condition interaction, $F(2, 85) = 3.50$, $p = .06$. As Table 2 demonstrates, implementation intention participants reacted considerably faster to critical action words (*M* = 617, *SD* = 109) than to neutral words (*M* = 712, *SD* = 168), whereas mental simulation participants reacted only slightly faster to critical action words (*M* = 621, *SD* = 112) than to neutral words (*M* = 677, *SD* = 129). However, no significant word type x experimental condition x prime interaction emerged, $F(2, 85) = 0.49$, $p = .61$, indicating that priming did not result in higher response rates following a relevant prime than following an irrelevant prime.

In sum, the results of Study 4 replicate the results of Study 3, insofar as results of the lexical decision task indicated that participants who had formed implementation intentions responded faster to the action words describing the target response than to the words describing a neutral response. On the other hand, mental simulation participants reacted only slightly faster to target words compared to neutral words. Thus, the results of the present study indicate that forming implementation intentions also leads to a higher activation of the target response contained in the then-component (and not just to a heightened activation of the situational cue specified in the if-component, as observed in the previous study). However, results of Study 4 did not indicate any differences in reaction times when target words were preceded by a relevant prime (situational cue of if-component of implementation intention) or by an irrelevant prime.

General Discussion

The model of action phases suggests that individuals in the predecisional phase (when choosing a goal) exhibit a deliberative mindset associated with a more open-minded processing of information, whereas individuals in the preactional phase (when planning the implementation of a goal) exhibit an implemental mindset with a more closed-minded processing of information. Hence, deliberative and implemental mindsets are theoretically and empirically associated with distinct action phases. In contrast, based on the current findings, we propose a more flexible approach to the question of mindsets and related phases of goal pursuit. Inasmuch as our findings hint at mental simulation and implementation intentions inducing two distinct mindsets, the former being associated with a more open-minded processing of information, and the latter associated with a more closed-minded processing of information, we postulate that depending on the type of planning technique (i.e., mental simulation vs. implementation intentions) used, a deliberative or implemental mindset is induced.

Thus far, implementation intentions and mental simulation have been considered as self-regulatory techniques furthering goal attainment in the preactional phase through enhancing planning of goal-directed activities. The task of planning goal-directed actions in the preactional phase is facilitated through an implemental mindset (Gollwitzer, 1990). However, it is postulated that an individual performing mental simulation can also exhibit a deliberative mindset in the preactional phase to further the implementation of a chosen goal. As mentioned before, research on hindsight bias and counterfactual priming supports this idea, suggesting that activation of a mental simulation mindset results in generating and considering additional alternatives (Hirt & Markmann, 1995; Hirt, Kardes & Markmann, 2004; Kahnemann & Tversky, 1982).

Studies 1 and 2 of the present research compared implementation intentions and mental simulation on their mode of cognitive functioning and suggested that mental simulation leads to a more open-minded processing of information, whereas implementation intention leads to a more closed-minded processing of information. In both studies, breadth of information processing was measured by having participants find alternatives for different means to a goal (i.e., for situational cues in Study 1 and for goal-directed responses in Study 2). The results indicated that participants in the mental simulation condition found more alternatives to presented situational cues (Study 1) and to goal-directed responses (Study 2). Implicating that finding more alternatives is associated with a more open-minded processing of information, and finding fewer alternatives with a more closed-minded processing of information, we take these findings as an indication that mental simulation induces a deliberative mindset and implementation intentions induce an implemental mindset.

While Study 1 only looked at differences regarding distinct mindsets activated by implementation intentions and mental simulation, Study 2 further included a cognitive load manipulation to investigate the effects of availability of cognitive resources on the activated mindsets. Results indicated that mental simulation participants generated a higher number of alternatives only under cognitive load, while both groups performed equally well in the no load condition. Hence, the mindset activated by implementation intentions (closed-minded processing of information) seems to be enhanced through cognitive load, while the mindset activated by mental simulation (more open-minded processing of information) seems to be unaffected by the depletion of resources.

In addition, we measured reaction times from stimulus onset (i.e., situations and goal-directed behaviors that alternatives were supposed to be found for appearing on the computer screen) to the participants' initial pressing of the keyboard when starting to come up with alternatives. In both studies, participants in the implementation intention condition responded faster to presented stimuli than mental simulation participants. Evidently, activating an implemental mindset through formation of implementation intentions leads to a stronger focus on before-hand specified means to a goal (situation and goal-directed behaviors) than performing mental simulations. We also interpreted this finding as a hint that there are differences regarding basic cognitive processes, such as activation levels of mental representations, which underlie the two mindsets activated by implementation intention and mental simulation.

Study 3 and 4 were designed to investigate the suggested differences regarding cognitive processes resulting from different mindsets by measuring activation levels of mental representations of implementation intentions and mental simulation via a lexical decision task. Study 3 focused on the mental representation of situational cues, and Study 4 on the mental representation of behavioral responses, respectively. In both studies, implementation intention participants demonstrated heightened activation of mental representations compared to mental simulation participants. This indicates that the distinct mindsets triggered by implementation intentions and mental simulation that are associated with differences in information processing (closed-minded vs. open-minded) base on different activation levels of mental representations of implementation intentions and mental simulation.

In sum, the present research provides strong evidence for implementation intentions and mental simulation activating differential mindsets that result in a more closed-minded or more open-minded processing of information. As mentioned before, the found results question the so far stringent theoretical and empirical distinction between deliberative and implemental mindset based on distinct phases in the model of action phases. Evidently, individuals can exhibit a deliberative mindset in the preactional phase when performing mental simulations.

Implications

What are the implications then for the model of action phases and the distinct mindsets involved on the way to goal attainment? In other words, if implementation intentions and mental simulation are both self-regulation techniques that foster goal attainment in the preactional phase, but do so through induction of different mindsets, when is it advisable to use one or the other? Should the decision of using either implementation intentions or mental simulation depend on, for example, personal preferences (i.e., one person might prefer to use mental simulation as a tool, while another person might prefer to form implementation intentions)? Or should it depend on considerations of effectiveness regarding specific circumstances related to the respective goal? Based on the present findings of differences in information processing related to use of mental simulations and implementation intentions (i.e., mental simulation leading to a more open-minded processing of information, and implementation intentions leading to a more closed-minded processing of information) we suggest that both planning techniques are effective at different stages in the preactional phase when planning the implementation of a goal. Mental simulation might be beneficial at the very beginning of planning goal-directed actions, as it induces a deliberative mindset associated with open-mindedness towards different types of information. When an individual has chosen a goal and moves on the preactional phase, mental simulation can help explore best ways of how to achieve that goal. On the other hand, once a decision for a path to a goal has been made, an individual should benefit from forming implementation intentions, which induce thoughts of when, where, and how to achieve the goal. In other words: in the preactional phase individuals might benefit from a deliberative mindset at the onset of planning goal-directed actions and an implemental mindset in a second step of finalizing specific plans.

Imagine again that you adopted the goal to lead a healthy lifestyle, a rather complex goal that can be achieved through many different ways. If this is the first time for you to adopt such a goal, then you might need to consider what the different ways to attainment of that goal are, and then plan according goal-directed actions. You might imagine that you eat healthier, do more sports, or stop smoking. At that stage of goal pursuit, you might benefit from performing mental simulations to find out the best suitable way to your goal. After having chosen one option of how to achieve your goal, you have to start with planning according goal-directed actions. At this stage, you might benefit from forming implementation intentions to clarify when, where, and how you will eat healthier (if you had decided on that route to your goal).

Taken together, we suggest that mental simulation and implementation intentions benefit the process of goal striving at different points in time and should therefore be employed accordingly.

Limitations

The results of the present research focused on investigation of the different mindsets associated with mental simulation and implementation intentions and only provide the basis for the assumption that the two self-regulation techniques should be employed at different points in time. Further studies are needed that systematically investigate this assumption. A study is needed, for example, that has participants adopt a goal, and then instruct one half to first perform mental simulation and then specify implementation intentions, and instruct the other half to first specify implementation intentions and then perform mental simulation. Furthermore, a study is needed that investigates the employment of mental simulation and implementation intentions at different points in time in the pre-actional phase regarding goals with different complexity. Goals that are rather complex with many different ways to go about might particularly benefit from first performing mental simulations, and then specifying implementation intentions. However, goals that are not complex and have only one or more ways to go about might not need the performance of mental simulations to find out the best way to go about, and might just benefit from specification of implementation intentions.

Conclusions

In conclusion, the studies presented in this line of research investigate cognitive processes (i.e., mindsets and activation of mental representations) triggered by implementation intentions and mental simulations that allow us to understand how these two self-regulation techniques promote goal attainment. Based on the present findings, implications for the model of action phases are suggested. Specifically, it was postulated that depending on what planning technique (i.e., mental simulations or implementation intentions) is used an implemental or a deliberative mindset can be induced in the pre-actional phase. It is suggested when planning the implementation of a goal (in the pre-actional phase) that mental simulation and implementation intentions be used at two different points in time during that phase in order to benefit the process of goal striving most effectively.

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Table 1

Mean Ratings of Generated Alternatives as a Function of Self-Regulation Technique and Cognitive Load

	Cognitive Load	
Self-Regulation Technique	No Load	Load
Mental Simulation	12.9	12.7
Implementation Intentions	11.8	9.5

Table 2

Mean Reaction Times as a Function of Self-Regulation Technique and Word Type

	Word Type	
Self-regulation technique	Target	Neutral
Mental Simulation	621	677
Implementation Intentions	617	712

Note. Reaction Times were measured in milliseconds

Artikel 3: Mentale Repräsentationen und kognitive Prozesse der Wenn-Dann-Planung

(The Mental Representations and Cognitive Procedures of IF-THEN Planning)

Introduction

The cognitive processes that support and maintain goal pursuit have become a central issue among researchers studying self-regulation and motivation (Gollwitzer & Bargh, 1994; Oettingen & Gollwitzer, 2001; Shah & Kruglanski, 2000; Sorrentino & Higgins, 1986). Two key notions in self-regulation research on goals are the model of action phases (Gollwitzer, 1990; Heckhausen, 1991; Heckhausen & Gollwitzer, 1987) and the concept of implementation intentions (Gollwitzer, 1993, 1996), as both address the complex interaction of cognitive and motivational processes. The model of action phases posits distinct consecutive stages of goal pursuit an individual has to successfully navigate to attain a goal, whereas implementation intentions (a concept stimulated by the action phase model) are specific self-regulatory tools aimed at helping individuals plan and initiate goal-directed actions. The focus of this chapter is on expanding the existing theoretical and empirical framework of both the theoretical model of action phases and the concept of implementation intentions by critically investigating the postulated cognitive processes.

The Model of Action Phases

Most theories of motivation and self-regulation converge on the idea that committing to a goal is the key act of willing that promotes goal attainment (e.g., Ajzen, 1991; Atkinson, 1957; Bandura, 1991; Carver & Scheier, 1998; Gollwitzer, 1990; Locke & Latham, 1990). The basic assumption is that the strength of a person’s intention to reach a goal (i.e., the goal intention) determines prospective accomplishments (Austin & Vancouver, 1996; Gollwitzer & Moskowitz, 1996; Oettingen & Gollwitzer, 2001; Sheeran, 2002). However, recent research on goals has demonstrated that variables other than strength of goal intention affect the intensity of goal striving and rate of goal attainment (reviews by Gollwitzer & Moskowitz, 1996; Oettingen & Gollwitzer, 2001). Assuming that committing to a goal is only a first step toward goal realization, the model of action phases (Gollwitzer, 1990; Heckhausen, 1991; Heckhausen & Gollwitzer, 1987) provides a first comprehensive account of goal attainment construing goal achievement in terms of solving a number of consecutive tasks. Making a goal committment is viewed as only the first of these tasks, with planning how to achieve the goal, getting started, and successfully completing goal striving as equally important subsequent tasks.

The model posits four different consecutive action phases of goal pursuit: the predecisional phase, the preactional phase, the actional phase, and the postactional phase (Gollwitzer, 1990; Heckhausen, 1991; Heckhausen & Gollwitzer, 1987). The main task individuals have to solve in the first, predecisional phase, is to make the best possible choice between different wishes they entertain, because people cannot act on all of their wishes. To achieve this selection or prioritization, they weigh the pros and cons of their wishes. These deliberations involve criteria of desirability and feasibility. Desirability of potential outcomes is determined through reflecting on their expected value by estimating the pleasantness-unpleasantness of potential short-term and long-term consequences. For instance, individuals might contemplate whether a certain outcome will lead to certain positive consequences, such as higher self-esteem or positive evaluation by significant others. When contemplating on the feasibility of a wish, individuals may consider how much time and resources are needed to achieve it. Once a wish has been given the highest preference, individuals are ready to make a commitment to realize this wish (i.e., form a goal intention), and thus move on to the next phase.

The main task in this subsequent postdecisional but still preactional phase is to plan the implementation of the chosen goal. Having formed a goal intention creates a feeling of committment, prompting people to start planning and implementing respective goal-directed actions for goal attainment. Accordingly, individuals in this phase address questions of *when* and *where* to start acting, *how* to act, and *how long* to act. The transition from the preactional phase to the actional phase is marked by action initiation. Successful action initiation depends on seizing favorable opportunities as soon as they present themselves. Individuals in the actional phase finally engage in activities to achieve their goals. Here it becomes important to shield ongoing goal-directed activities from becoming derailed by distractions, difficulties, and hindrances. In the postactional phase, individuals have to solve the final task of evaluating the success of goal-attainment. This involves contemplation of whether the intended outcomes have been sufficiently reached and whether the actual value of the achieved goal matches the expected value estimated beforehand.

Mindsets and the Model of Action Phases

The model of action phases implies that undertaking the four distinct tasks described above activate congruent *mindsets* (i.e., phase-typical cognitive procedures that promote successful task completion; Gollwitzer, 1990). So far, a body of research has theoretically and empirically distinguished between deliberative and implemental mindsets; that is, differences in cognitive processes when an individual is choosing a goal as compared to planning the attainment of a goal (summaries by Gollwitzer, 1990; Gollwitzer & Bayer, 1999; Gollwitzer, Fujita, & Oettingen, 2004).

Deliberative and Implemental Mindsets: Empirical Support

Research on the features of deliberative and implemental mindsets has primarily looked at differences in regard to two cognitive procedures: cognitive tuning and biased inferences. Several studies exploring differences between the two mindsets in cognitive tuning used the thought sampling technique to demonstrate that a deliberative mindset produces thoughts about expectancy-value issues, that is, thoughts focusing on aspects of goal feasibility and desirability (Heckhausen & Gollwitzer, 1987; Puca & Schmalt, 2001; Taylor & Gollwitzer, 1995). On the other hand, thoughts of individuals in an implemental mindset are focused on the when, where, and how of goal implementation. Using a cued-recall task, Gollwitzer, Heckhausen, and Steller (1990) found in addition that individuals in a deliberative mindset process information on expectancy-value issues more effectively than individuals in an implemental mindset, while individuals in an implemental mindset process information on goal implementation more effectively than individuals in a deliberative mindset. These findings suggest that cognitive tuning in deliberative and implemental mindsets is task-congruous, that is, it is tuned toward thought contents that allow choosing between goals versus implementing a chosen goal, respectively.

Further, research on biased information processing suggests that individuals in a deliberative mindset analyze information more impartially, as their task is to choose between different wishes (i.e., they need to decide which wish is to be turned into a binding goal). Individuals in an implemental mind-set, on the other hand, tend to analyze information in a more partial way, as they tend to look for information that justifies the goal choices made and thus supports goal implementation (Amor & Taylor, 2003; Gagne & Lydon, 2001; Gollwitzer & Kinney, 1989; Taylor & Gollwitzer, 1995). For example, Taylor and Gollwitzer (1995, Study 3) have demonstrated in a study on considerations of pros and cons for decision-making, that an implemental mindset makes individuals consider pros fives times more than cons, while a deliberative mindset leads to the balanced consideration of pros and cons. These differences in considering pros and cons suggest that deliberating one's wishes activates even-handed processing of information that should benefit a good goal decision (i.e., choosing goals that are desirable and feasible). Planning the implementation of a chosen goal, on the other hand, activates partial processing of information (i.e., preferential consideration of pros over cons). The latter should help defend the goal decision and thus protect it from questioning one's goal commitment what otherwise could hinder goal attainment.

Deliberative and Implemental Mindsets: Open-Mindedness to Information

A further suggested difference between deliberative and implemental mindsets is openness to information. Gollwitzer (1990) argues that due to the different tasks associated with deliberative and implemental mindsets (i.e., making a goal decision versus implementing a chosen goal) individuals in a deliberative mindset should be particularly open to any available information that might help them with the decision-making process (referred to as "general open-mindedness to information"). When assessing desirability and feasibility, it seems beneficial to approach different pieces of information with a general open-mindedness, because it is initially unclear which pieces of information are particularly relevant to the decision to be made. In contrast, individuals in an implemental mindset, are primarily concerned with information on the when, where, and how of goal implementation. They process information more selectively, focusing on goal-relevant stimuli, while ignoring goal-irrelevant stimuli. As a result, a deliberative mindset is associated with open-mindedness to information and an implemental mindset with more closed-minded processing of information.

The suggested differences in open-mindedness between deliberative and implemental mindsets have recently been investigated by Fujita, Gollwitzer, and Oettingen (2007). In three studies, a deliberative mindset led to superior recognition memory for incidental information than an implemental mindset. For example, in Study 3, participants were either assigned to the deliberative mindset, the implemental mindset, or a control condition. After the mindset manipulation, all participants had to perform a computerized concentration test. Randomly during the test, participants were presented with semantically unrelated incidental words (e.g., bone, every, flag, always). After filling out various questionnaires, participants were asked to perform a surprise computerized recognition memory test containing the initially presented incidental words. Participants in the deliberative mindset performed significantly better on the recognition memory test than those in the implemental mindset and the control conditions, indicating that deliberative mindsets are marked by more open-minded processing of available information than implemental mindsets.

Implementation Intentions: A Strategy for Effective Self-Regulation of Goal Pursuit

As mentioned earlier, accumulated evidence indicates that the single act of willing involved in forming a goal intention does not appear to be sufficient to ensure goal achievement (review by Gollwitzer & Sheeran, 2006; Sheeran, 2002; Webb & Sheeran, 2006). Investigating the reasons for the modest intention-behavior relation, it appears that this "gap" is largely due to the fact that people, despite having formed strong intentions, fail to act on them (e.g., Orball & Sheeran, 1998). To address this issue, Gollwitzer (1993, 1996, 1999) introduced the concept of *implementation intentions* to help overcome self-regulatory problems in goal striving. Stimulated by the action phase model, Gollwitzer suggested that successful goal attainment is facilitated by a second act of willing wherein the goal intention is furnished with an if-then plan (i.e., an implementation intention) that specifies in a concrete manner how a goal intention is to be realized. Such plans are assumed to help people successfully achieve the task they are confronted with in the preactional phase of goal pursuit – instigating actions that are instrumental to attaining the chosen goal.

Implementation intentions are if-then plans that link good opportunities to act to behavioral responses that are effective in accomplishing one's goals. Implementation intentions are to be distinguished from goal intentions. Whereas goal intentions specify what one wants to achieve (i.e., "I intend to reach *Z*!"), implementation intentions specify both the behavior that one will perform in the service of goal achievement and the situational context in which one will enact it (i.e., "If situation *X* occurs, then I will initiate goal-directed behavior *Y*!"). Thus, a goal intention refers to *what* one intends to achieve, whereas an implementation intention specifies *when*, *where*, and *how* one intends to achieve it.

To form an implementation intention, the person must first identify a response that will promote goal attainment and, second, anticipate a suitable occasion to initiate that response. For instance, a possible implementation intention in the service of the goal intention of pursuing a healthy life-style would link an appropriate behavior (e.g., ordering green tea) to a suitable situational context (e.g., having dinner at a restaurant). As a consequence, a strong link is created between the critical situation of having dinner at a restaurant and the goal-directed response of ordering green tea.

A wealth of research has demonstrated the beneficial effects of implementation intentions as self-regulatory tool on goal attainment. For example, Gollwitzer and Schaal (1998) demonstrated that subjects who had formed an implementation intention in addition to a goal intention were able to solve more arithmetic problems despite being distracted by simultaneously shown film clips of advertisement, compared to subjects who had only formed a goal intention. Implementation intentions have been shown to be effective in promoting infrequently performed behaviors (e.g., cancer screening; Sheeran & Orbell 2000) and daily-performed behaviors (e.g., supplement use; Sheeran & Orbell, 1999), no matter whether self-report or objective measures of performance were taken (e.g., Gollwitzer & Brandstätter, 1997; Milne, Orbell, & Sheeran, 2002). The effects on behavioral performance were shown among students, the general public, and clinical samples (e.g., Lengfelder & Gollwitzer, 2000; Orbell, Hodgkins, & Sheeran, 1997; Brandstätter, Lengfelder, & Gollwitzer, 2001). To this end, Gollwitzer and Sheeran (2006) conducted a meta-analysis analyzing the effectiveness of implementation intentions for self-regulatory problems concerned with initiating goal pursuit, shielding ongoing goal pursuit from unwanted influences, disengaging from failing goals, and conserving capacity for future goal striving. Findings from 94 independent studies of the impact of implementation intentions on goal achievement showed that implementation intentions have a positive effect on goal attainment that is of medium-to-large size (d = .65). This finding was robust across variations in study design, outcome measurement, and domains of goal attainment.

So far, two processes have been proposed to explain why implementation intentions benefit goal achievement, relating either to the anticipated situation (i.e., the if-part) or the goal-directed behavior (i.e., the then-part). As forming implementation intentions implies the *selection* of a critical future situation (i.e., a viable opportunity), the mental representation of this situation is assumed to become highly activated and hence more accessible (Gollwitzer, 1993, 1996, 1999). Forming an implementation intention involves the selection of a situation that is ripe for action, thereby rendering the critical situation salient. This idea implies that people process information about the critical situation in a highly proficient manner (Gollwitzer, 1993; Gollwitzer, Bayer, Steller, & Bargh, 2004; Webb & Sheeran, 2006). Therefore, compared to those who merely form a respective goal intention, people who form implementation intentions are assumed to exhibit increased sensitivity to the critical cue. Various experiments (for a summary, see Gollwitzer, 1999) demonstrate that participants holding implementation intentions were more likely to detect (e.g., Steller, 1992), remember (e.g., Gottschaldt, 1926; Witkin, 1950), and attend (e.g., Seehausen, Bayer, & Gollwitzer, 1994) to the critical situation compared to participants who had only formed goal intentions.

Implementation intentions have also been shown to benefit action initiation through processes of *automatization* (Gollwitzer, 1993, 1996). Gollwitzer (1993) argues that forming an implementation intention (i.e., linking a critical situation to an intended behavior in the form of an if-then plan) is a conscious act of will that effectively delegates control of behavior from the self to specified situational cues that directly elicit action (also described as strategic "delegation of control to situational cues"). Forming an if-then plan means that the person commits herself in advance to acting as soon as certain contextual constraints are satisfied. Once the specified situation is encountered, action initiation should proceed swiftly and effortlessly, without requiring the person's conscious intent. Thus, the execution of a behavior specified in an implementation intention is assumed to exhibit features of automaticity as identified by Bargh (1992, 1994) and Moors and De Houwer (2006). The postulated automation of action initiation has been supported by the results of various experiments that tested immediacy (e.g., Gollwitzer & Brandstätter, 1997, Experiment 3; Webb & Sheeran, 2006), efficiency (e.g., Brandstätter, Lengfelder, & Gollwitzer, 2001; Lengfelder & Gollwitzer, 2001), and the absence of conscious intent (e.g., Bayer, Moskowitz, & Gollwitzer, 2004; Sheeran, Webb, & Gollwitzer, 2005; overview by Gollwitzer & Sheeran, 2006). In sum, the facilitating effects of implementation intentions appear to be associated with enhanced accessibility of good opportunities to act (if-component) and with the automation of goal-directed responding (then-component).

Mental Simulation and Implementation Intentions: Two Distinct Self-Regulation Techniques for Goal Striving

In addition to implementation intentions, there are other self-regulation techniques that lead to successful goal attainment, namely mental simulations. Conceptually different from implementation intentions (i.e., linkage of cues and responses in an if-then format), mental simulations can best be described as "imitative mental representations of some event or a series of events" (Taylor & Schneider, 1989). When planning via mental simulation, a desired end state is approached through exploration of possible paths to goal attainment. Taylor, Pham, Rivkin, and Armor (1998) call such mental simulations process simulations, that is, the process of goal attainment is imagined step-by-step. Similar to implementation intentions, the effects of mental simulation have been found to promote goal attainment in many different domains, such as academic achievement (Pham & Taylor, 1999; Taylor & Pham, 1999), improving health-related behavior (Greitemeyer & Würz, in press), and facilitate behavioral intentions in the consumer domain (Escalas & Luce, 2003, 2004; Phillips, Olson, &

Baumgartner, 1995). Why do process-focused mental simulations benefit goal achievement? Several studies have demonstrated that the beneficial effects of mental simulation on the achievement of desired outcomes is linked to enhanced levels of planning, that is, action plan formation (Escalas & Luce, 2003, 2004; Rivkin & Taylor, 1999). Thus, both mental simulation and implementation intentions further goal attainment through enhanced planning of goal-directed actions.

However, the way in which mental simulations benefit the planning process should differ from that furthered by implementation intentions. The planning process associated with a mental simulation is marked by exploration of possible means or paths to a goal; while the formation of an implementation intention leads to the selection of a suitable situation which is then linked to a goal-directed response. No research to date has compared the two self-regulation tools against each other to detect differences and commonalities. To address this question will help to better understand the various ways in which people can self-regulate goal striving by planning.

In the following section, we introduce four studies that compare the cognitive functioning of two distinct self-regulations tools: implementation intentions versus mental simulations. The first set of studies explores differences in mindsets induced by if-then plans versus mental simulation. The second set of studies builds upon the initial results and investigates activation levels of the underlying mental representations implicated by the different planning techniques.

Research on Mindsets Induced by Implementation Intentions versus Mental Simulation

Does mental simulation versus forming an if-then plan activate different mind-sets? If-then plans and mental simulations have thus far been considered as self-regulatory techniques that further goal attainment in the preactional phase through enhanced planning of goal-directed activities. The mindset associated with this stage of the model of action phases is an implemental mindset (Gollwitzer, 1990). However, we postulate that an individual can also exhibit a deliberative mindset in the preactional phase when performing mental simulations. Empirical support for this assumption is provided by research on hindsight bias and counterfactual priming, which suggests that inducing a mental simulation mindset results in generating and considering additional alternatives (Hirt & Markmann, 1995; Hirt, Kardes & Markmann, 2004; Kahnemann & Tversky, 1982). As mentioned before, finding and considering alternative ways of goal attainment is a feature associated with an open-minded processing of information and hence resembles a deliberative mindset. On the other hand, several studies have demonstrated that forming if-then plans tunes individuals' thoughts into the when, where, and how of goal implementation, a feature associated with an implemental mindset (Fujita, Gollwitzer, & Oettingen, 2006; Gollwitzer & Bayer, 1999; Taylor & Gollwitzer, 1995). Fujita, Gollwitzer, and Oettingen (2007) further argue that deliberative mindsets are associated with greater openness to different sources and types of information. An implemental mindset then again, is associated with filtering of information and selective processing of stimuli (e.g., Gollwitzer, 1990; Kuhl, 1984). Therefore, the following two studies aimed at testing the following assumption: mental simulation induces a deliberative mindset associated with a more open-minded processing of information (i.e., considering various means for a given goal), whereas forming if-then plans induces an implemental mind-set associated with a more closed-minded processing of information (i.e., focusing on one particular means to a given goal).

In order to measure breadth of information processing, we asked participants to generate alternatives of situational opportunities and goal-directed responses. Situational cues and goal-directed responses are both considered as means to a goal and represent the two parts of an implementation intention, that is the if-part and the then-part. The structure of an if-then plan was reflected in our studies, such that the first study targeted the anticipated situation specified in the if-component of the implementation intention, and the second study targeted the critical response specified in the then-component. The second study further included a cognitive load condition a) to replicate previous findings showing that implementation intentions operate efficiently (e.g., Brandstätter et al., Study 2 and 3) and b) to explore the effect of cognitive load on mental simulation.

In the first study, undergraduate students were asked to adopt the goal "to do well in school." Next, half of the participants listened to a tape-recorded mental simulation, describing three different scenarios beneficial to the given goal (i.e., reading a textbook and marking passages in it with a highlighter, taking notes on a notepad in a lecture, writing an essay on a laptop). Participants were instructed to visualize the described scenarios as vividly as possible. In sum, the three scenarios contained a total of five critical situational cues (i.e., highlighter, textbook, notepad, laptop, lecture). The other half of the participants was asked to adopt five implementation intentions in the service of the adopted goal. The assigned if-then plans contained the same five situational cues described above as elements of the if-part of the plans (e.g., "If I sit in front of my *textbook*, then I will read every passage very carefully"). Finally, participants in the mental simulation and implementation intention conditions were seated in front of a computer and presented with the five situational cues. For each stimulus, they were asked to come up with as many alternatives as possible during a time period of 3 minutes. At the same time, we measured the time of stimulus onset (i.e., the presentation of the situational cues on the computer screen) to the moment when participants first pressed a key on the keyboard to start typing in alternatives. Hence, our dependent variables consisted of the mean number of generated alternatives to the presented stimuli and mean reaction times.

Mental simulation participants created more possible alternatives for the presented situational cues than implementation intention participants. However, after presentation of the situational cues, implementation intention participants started faster with typing in alternatives to the cues than mental simulation participants. The conclusions of the reported results are twofold. First, the mindset induced by mental simulation seems to enhance open-mindedness in the sense of having it easy to generate alternatives to presented situational cues. On the other hand, forming if-then plans seems to lead to a more closed-minded processing of information, as indicated by producing fewer alternatives. Second, we observed that if-then plans not only lead to an overall more narrow focus, but also lead to a stronger focus on the situation specified before-hand, indicated by implementation intention participants' shorter reaction times between stimulus onset (i.e., presentation of the situational cues) and their initial response (i.e., starting to type in alternatives for the presented cues). Overall, these results suggest that mental simulation seems to create an exploratory mindset with associated open-mindedness, while if-then plans lead to a mindset with a more closed-minded focus on the situations specified in the if-part of the implementation intentions.

The second study targeted the *then*-component of an implementation intention. Besides replicating the previous results, we wanted to demonstrate that mental simulation leads to finding more possible goal-directed actions. Furthermore, we included cognitive load to explore whether mental simulation would be affected by cognitive load. The procedure of this study was very similar to the previous one with the exception that participants had to generate their own mental simulations or implementation intentions (as opposed to listening to a pre-recorded mental simulation or adopting assigned if-then plans). The goal given to participants was "to study effectively for an upcoming exam." Mental simulation participants were asked to visualize three different self-generated scenarios of studying for an exam. To this end, mental simulation participants were provided with three general examples of scenarios they could visualize (i.e., reading a textbook, memorizing lecture materials, summarizing passages of a textbook), but were then prompted to come up with their own scenarios. They were told to visualize each scenario for at least one minute. After each visualization participants had to briefly summarize the content of their visualization (e.g., "I see myself sitting at home at my desk and writing a paper for class"). Accordingly, participants in the implementation intention condition were first provided with the same three examples of studying as mental simulation participants and then asked to generate three different if-then plans related to this goal. Specifically, they were asked to specify *when*, *where*, and *how* they would study. Implementation intention participants specified, for instance, "If I sit at home at my desk, then I will read my textbook carefully," or "If I am in the library, then I will read my lecture materials." They were told to read each of the three self-generated plans three times. Next, all participants were presented with three of the situational cues related to studying they had previously specified (e.g., textbook, desk, lecture material) on a computer screen. For each presented cue, they were asked to generate as many goal-directed responses (i.e., behaviors they considered as beneficial for the given goal in that particular situation) as possible. For example, if "desk" was one of the previously generated situations of a particular participant, she might have generated "writing, reading, concentrating" as different kinds of behaviors related to studying that she thought of performing at a desk (i.e., goal-related responses). The situational cues presented to participants on the computer screen differed for each participant, as they were chosen from their individually created materials. As soon as they started working on the computer task, half of the mental simulation and half of the implementation intention participants were put under cognitive load by asking them to count the number of vowels presented to them over headphones.

Mental simulation participants generated more possible action words related to presented situational cues (i.e., the cues that were selected from the individual mental simulations or implementation intentions) than implementation intention participants. However, this effect was affected by the cognitive load manipulation: Mental simulation participants generated a higher number of action words than if-then plan participants only under cognitive load, while under no load both groups performed equally well. Evidently, the open-mindedness activated by mental simulations seems to be unaffected by depletion of resources. The generation of more action words under no load than under load by if-then plan participants, on the other hand, indicates that the activated closed-mindedness was also affected by the load manipulation. In other words, closed-mindedness is increased by cognitive load. It appears then, that the cognitive orientation typical for mental simulation (open-mindedness) versus forming implementation intentions (closed-mindedness) is enhanced when cognitive resources become scarce. As habitual behavioral and cognitive orientations are commonly unaffected by load, we take this finding to mean that the habitual cognitive orientation of mental simulation is open-mindedness, whereas the habitual cognitive orientation of forming implementation intentions is closed-mindedness.

Research on the Activation of Mental Representations by Implementation Intentions versus Mental Simulations

In the next two studies we compared the activation of the mental representations that underlie if-then plans and mental simulations. As indirect measures have become the norm to measure construct activation (e.g., Kruglanski et al., 2002; Marsh & Landau, 1995; Shah & Kruglanski, 2000), we used a lexical decision task. Specifically, we compared the activation of the mental representation of critical situational stimuli and goal-directed responses when mentally simulating or forming if-then plans. One study focused on the *if*-

component of an implementation intention, assessing the mental representation of the specified situation, whereas the other study focused on its *then*-component, assessing the mental representation of the goal-directed response. In both studies, assigned if-then plans and mental simulations were used to ensure that heightened accessibility would not be muddled by semantic relatedness between words.

Upon their arrival at the laboratory, participants were asked to adopt the goal "to do well in school." Next, mental simulation participants had to listen to a tape-recorded mental simulation, describing three scenarios beneficial to the given goal (i.e., highlighting important passages in a textbook with a highlighter, writing an essay on a laptop, writing notes on a notepad during class). Hence, the mental simulation contained a total of five critical situational cues (i.e., textbook, highlighter, laptop, essay, notepad). Implementation intention participants were asked to adopt two if-then plans related to the goal, each plan containing one of the five situational cues mentioned above (e.g., "If I have a *highlighter* in my hand, then I will underline important passages in my lecture materials"). Implementation intention participants were presented with the remaining situational cues (i.e., the situational cues that were not contained in their if-then plans) through a "spelling test" to ensure equal exposure to the stimuli across conditions. This test contained the three situational cues plus misspelled words and participants were asked to correct any misspelled words. Finally, all participants were seated in front of a computer screen to perform a lexical decision task that contained the five situational cues (i.e., textbook, highlighter, laptop, essay, notepad), five matched neutral words, and ten nonwords.

The lexical decision task yielded faster reaction times to critical situational cues for implementation intention participants than for mental simulation. This result indicates that forming implementation intentions leads to higher activation levels for the situation-words than mentally simulating. Additional analyses demonstrated that among implementation intention participants, only those situation-words that were part of an if-then plan showed higher activation levels, but not the situation-words that were presented in the "spelling test." Mental simulation participants demonstrated equal activation levels for all five situation-words, but their overall activation levels were lower than those of implementation intention participants. Thus, implementation intention participants seemed to focus on the two situational cues contained in their implementation intentions, while mental simulation participants focused on all five situation words equally strong.

The aim of a follow-up study was to replicate these findings with regard to the *then*-component of an implementation intention. This time, we used the goal "to lead a healthy life-style." One half of the participants had to perform a mental simulation describing three different goal-directed actions related to the goal (i.e., climbing the stairs, cooking a healthy meal, exercising in the gym). The other half of the participants had to adopt three if-then plans containing the three goal-directed actions of the mental simulation in the then-part of the plan (i.e., "If I enter a multi-story building, then I will climb the stairs instead of taking the elevator", "If I have a friend over for dinner, then I will cook a healthy meal that includes vegetables", "If I am on campus and have some free time, then I will go exercise at the gym"). Next, participants had to perform a lexical decision task containing the three critical action words, three matched neutral words, and six non-words.

Results of the lexical decision task indicated that participants who had formed if-then plans responded faster to the action words describing the target response than to the words describing a neutral response. On the other hand, mental simulation participants reacted only slightly faster to target words compared to neutral words. Thus, the results of the present study indicate that forming if-then plans also leads to a higher activation of the target response contained in the then-component (and not just to a heightened activation of the situational cue specified in the if-component, as observed in the previous study).

In sum, the findings of the last two studies presented suggest that forming if-then plans not only leads to higher activation of the specified situational cues, but also to higher activation of the before-hand specified behavioral response, as is observed for mental simulations that contain these situations and responses.

Implementation Intentions as Mental Constructs: Recent Findings

The two latter studies presented above primarily addressed the question of how the different modes of information processing that implementation intentions and mental simulations trigger (i.e., closed- vs. open-mindedness) are associated with different activation levels of the mental representations of relevant situations and responses. However, these results also provide new insights about the basic cognitive properties that may underlie the beneficial effects of implementation intention formation per se. According to the present findings, formation of implementation intentions (i.e., if-then linkage of specified situations and goal-directed behaviors) leads to higher activation of the mental representations of both of an if-then plan's components (i.e., the situation and the goal-directed behavior) in comparison to the mental representation of respective components that have only been mentally simulated.

As mentioned earlier, two component processes have so far been postulated and empirically supported to explain implementation intentions' effectiveness: heightened accessibility of the specified situation and automatic initiation of the goal-directed behavior. In other words, only one component of if-then plans, that is the specified situation, has been referred to and investigated on a cognitive level. Yet the question of how the goal-directed behavior (i.e., the then-component) is mentally represented has received no theoretical analysis or empirical attention. Rather, hitherto research on the then-component of an implementation intention has been limited to a behavioral level, investigating the features of goal-directed behavior when being triggered by the specified situation. That is, the specified behavior within an implementation intention has been merely conceptualized as automatic response to the stimulus cue, without consideration of potential intervening mental processes.

Hence, above reported results not only contribute to evidence that forming an if-then plan enhances activation of the if-component, but also constitute first evidence of the mental representation and heightened activation of the plan's then-component upon implementation intention formation. It therefore seems plausible to argue that (a) two cognitive processes – the heightened activation of the if- and then-component, respectively –underlie the beneficial effects of implementation intention formation and that (b) upon formation of an implementation intention (i.e., linking the specified situation to the goal-directed response) both components, that is the if- and then-component, become activated at the same time. However, these conclusions are premature particularly as activation levels of the if- and then-components of implementation intentions were measured in two separate studies and in each study the if-then plans were formed in the service of a different goal.

Therefore, the following line of research (Faude, 2005) attempted a critical, more specific test of the hypothesis of co-activation of implementation intentions' two components. Specifically, the following assumptions were made regarding the anticipated situation and the goal-directed behavior as elements of an implementation intention: (1) Both components are mentally represented as knowledge structure and become simultaneously highly activated upon formation of the if-then plan, and (2) the heightened accessibility of both elements is a result of (a) their superior status due to having been linked in an 'if-then' format, and (b) the functional relation between the two components. Three experiments tested these assumptions using lexical decision latencies to assess levels of activation.

Forming If-Then Plans: Activation of Both Components?

It was determined that the best method to preliminarily investigate the mental representation of implementation intentions' both components was to compare the accessibility of the anticipated situation and the goal-directed behavior between participants who had been asked to form if-then plans (experimental condition) and participants who had been equally exposed to the situation- and behavior-words but had not formed a plan (yoked control condition). Based on Gollwitzer's (1993, 1996) argument that the selection of an implementation intention's particular component leads to heightened activation, the first study used self-generated if-then plans.

Experimental subjects were first asked to generate self-relevant goals in one of two given domains (i.e., health and personal relationships) by completing the sentence "I want to …" (e.g., "I want to improve my relationship." as interpersonal goal). Second, subjects were asked to list four *behaviors* (e.g., "forgive) they thought of beneficial for achieving their goal and then asked to generate relevant *situations* (e.g., "conversation") in which they wanted to carry out the behaviors they had listed before. Finally, they were asked to form implementation intentions by formulating an "IF..., THEN…" plan using the previously generated behaviors and situations to fill in the blanks and create a meaningful sentence (e.g., "IF I am disappointed in a conversation, THEN I will forgive!"). In sum experimental participants were asked to form eight implementation intentions (four per goal). Control participants were yoked to experimental participants by being exposed to the situation- and behavior-words that the respective experimental participant had generated beforehand, this by asking them to work on word lists.

Next, a lexical decision was administered to measure the accessibility of implementation intentions' components. The lexical decision included the critical words (i.e., previously generated situations and goal-directed responses) and non-words. Hence, the words used in the lexical decision task differed for each participant in the experimental condition. Within the yoked control condition, the words in the lexical decision task corresponded to the materials of the participant in the implementation intention condition they were yoked to.

Participants who had generated if-then plans responded significantly faster to situation-words and behavior-words than participants in the yoked control condition who had not formed plans. Applying the standard assumption that faster latencies reflect more activation (e.g., Anderson, 1983; Ratcliff & McKoon, 1978), the present findings indicate that linking a specified situation to a goal-directed behavior in an if-then format (i.e., forming an implementation intention) leads to enhanced activation of the mental representation of both components of the plan (i.e., the specified situation *and* the goal-directed behavior).

Components of If-Then Plans: Co-Activation Due to Their Functional Relation and Superior Status

The reasons behind conducting Experiment 2 were multifold. First, the aim was to replicate findings of Experiment 1 by introducing assigned (vs. self-generated) implementation intentions. Introducing assigned plans allowed for testing of the hypothesis that the heightened accessibility of implementation intentions' components is due to the superior status of the anticipated situation and the goal-directed behavior upon being linked in an if-then format and not due to a generation effect of the components. Second, to further investigate the superior status hypothesis, Experiment 2 used the same basic design as Experiment 1, but was augmented in the following ways. An equifinal goal-plan structure was used that included one goal only and six implementation intentions. According to conventional goal architecture, lateral relations within a goal system are assumed to be primarily inhibitory (Kruglanski et al., 2002; Shah, Kruglanski, & Friedman, 2003). Introducing several lateral relations on mean level by assigning multiple implementation intentions in the service of one goal should allow for conservative testing of the accessibility of the mental representation of the plans' components. Further, a new condition was added in which participants were assigned the same goal intention as participants in the implementation intention condition, but were not assigned any plan. Including a "goal-only" condition allowed addressing the question if holding a goal intention only might suffice to activate certain goal facilitating situations and behaviors, without the need of forming specific plans. Third, to provide more direct support for the argument that heightened activation of implementation intentions' components is based on a functional (and not merely semantic) relation between these components, only semantically unrelated words were chosen for the situation and goal-directed behavior of to be assigned implementation intentions.

The materials consisted of one goal intention (i.e., "becoming socially integrated") plus six corresponding if-then plans. The implementation intentions were formulated to suit the participants (i.e., students) and to serve the attainment of the goal intention (e.g., "If I am at the gym, then I will introduce myself to a fellow student."). Each if-then plan contained two critical words for the lexical decision task that corresponded to the situation (e.g., "gym") and the goal-directed behavior (e.g., "introduce"). First, the goal was assigned to participants in the implementation intention condition and goal-only condition by asking them to read the goal and write it down. Next, subjects in the implementation intention condition were asked to adopt the six plans by reading the plans and then filling in blanks that denoted the situation- and behavior-words (e.g., "If I am at the ____, then I will ____ myself."). Subjects in the goal-only and control condition were presented with a word list that contained the situation- and behavior-words of the implementation intentions in order to ensure equal encoding of the critical words to be used in the lexical decision task across conditions. Finally the identical lexical decision task was introduced to all three conditions.

Forming assigned implementation intentions lead to heightened activation of both its components (i.e., the specified situation and the goal-directed behavior), as indicated by shorter mean response times to the situation and behavior-words for subjects who had formed if-then plans compared to subjects who had not (i.e., goal-only and control participants). Further, response times to the critical words did not differ between the goal-only and the control condition and comparing response latencies between the different plans in the implementation intention condition revealed no significant differences.

Demonstrating the robustness of the previous findings (i.e., simultaneous activation of if-then plans' both components upon having formed an implementation intention), this result was hereinafter referred to as *plan activation effect*. In particular, the results offer evidence that this effect is functional rather than semantic (as only semantically unrelated words were used). In addition, activation of if-then plans' components were found to be neither attributable to a generation effect of the components (as assigned implementation intentions were used), nor to a goal activation effect (as reaction times between the goal-only condition and the control condition did not differ). Indicating that the plan activation effect is a result of a superior status of the components of implementation intentions. The 'superior status' is further supported by the fact that the plan activation effect was found within an equifinal goal system of one goal with several, potentially reciprocal inhibiting, lateral relations on means level (i.e., six implementation intentions). The 1-goal – 6-plans structure did not attenuate the response latency advantage of the specified situations and the goal-directed behaviors. In addition, comparing response times between the different plans revealed no significant differences, indicating that the strength (i.e., the activation) of one plan's components was not weakened by the presence of other available plans linked to that goal. That plan activation seems to be independent of competition among different if-then plans and that the components within an implementation intention appear to be less susceptible to inhibition as means in a conventional sense, attests to the superior status of the specified situation and the goal-directed behavior by being linked in an if-then format.

Automaticity in Plan Activation

The aim of Experiment 3 was to investigate if the effect of plan activation is based on a consciously controlled process (i.e., requiring cognitive resources), or rather due to an automatic process that is characterized by its crucial features of immediacy, efficiency (i.e., not requiring much cognitive resources), and lack of conscious intent (Bargh, 1994, 1996, 1997; Bargh & Chartrand, 1999; Logan, 1992; Shiffrin & Schneider, 1977). Findings of the two previous experiments can so far be interpreted as the plan activation process displaying two characteristics of automaticity, namely the lack of conscious intent (as the measure of activation consisted of an indirect measure, i.e., lexical decision) and immediacy (as higher activation of if-then plans' components could be observed from the onset of activation measurement). However, thus far it is unclear if the cognitive advantage of implementation intentions' components is contingent on the amount of available cognitive resources. It might be that upon forming an implementation intention, its components (i.e., the situation and the goal-directed behavior) initially become more salient, but that a consciously controlled process, such as the selective use of a strategy (e.g., rehearsing or imagining the if-then plan) might be needed to then activate these components. In this case, plan activation would be contingent on the amount of available cognitive capacity. However, if the activation of implementation intentions' components does not require a controlled process but rather runs off automatically upon forming an implementation intention due to the components' superior status, then plan activation should be found even when mental load is high (i.e., cognitive resources are taxed).

In order to address the question of automaticity in if-then plan activation, the lexical decision task in Experiment 3 was administered under mental load and activation levels of if-then plans' components were compared between implementation intentions and goal-only subjects. Based on the design of Experiment 2, in Experiment 3, high levels of cognitive load were induced by presenting the target words in the lexical decision with a background pattern (following Park, Hertzog, Kidder, Morrell, & Mayhorn, 1997). The dual-task consisted of participants having to remember how many different background patterns they saw simultaneously to making lexical decisions.

As predicted, a higher activation of implementation intentions' components was also found under conditions of high cognitive load as indicated by shorter mean response times to the situation- and behavior-words in the implementation intention condition compared to the goal-only condition. Evidently, the plan activation effect is based on an automatic process that does not require cognitive resources. Taken together, the results of Study 3 (a) closely replicate the plan activation effect (i.e., co-activation of implementation intentions' both components upon formation of such plans) found in Studies 1 and 2 and (b) show that this effect appears to fulfill the three criteria of automaticity: immediacy, lack of conscious intent, and efficiency (i.e., not requiring cognitive resources; Bargh, 1994, 1996, 1997; Bargh & Chartrand, 1999; Logan, 1992).

Conclusions and Implications

This chapter had two primary objectives. First, it contrasted implementation intentions and mental simulations (i.e., two planning strategies shown to enhance goal attainment) on their mode of cognitive functioning, and based on the results, suggested implications for the model of action phases. Second, the basic cognitive properties of implementation intentions were mapped out by investigating the mental representation of its two components (i.e., the specified cue and the goal-directed response).

At the outset of the chapter, the so far stringent theoretical and empirical association of deliberative and implemental mindsets with distinct action phases (i.e., the predecisional and the preactional phase, respectively) was questioned (Würz, Gollwitzer, & Greitemeyer, 2007). According to the model of action phases, choosing a goal (in the predecisional phase) activates a deliberative mindset, whereas planning the implementation of a goal (in the preactional phase) activates an implemental mindset. In contrast, we proposed a more flexible approach to the question of mindsets and related stages of goal pursuit.

We postulated that becoming involved with planning the implementation of a chosen goal induces an implemental or a deliberative mindset, depending on what planning technique (i.e., mental simulations or implementation intentions) is used. The results of two studies were consistent with this postulate.

In Studies 1 and 2, open- versus closed-minded information processing (as characteristic of differential mindsets) for participants in an implementation intention and a mental simulation condition was investigated by having to generate different means to a goal (i.e., situational opportunities in Study 1 and goal-directed responses in Study 2). In both studies, participants in the mental simulation condition came up with more means compared to participants in the implementation intention condition. These results indicate that mental simulation induces a deliberative mindset associated with more open-mindedness (a feature previously solely associated with the predecisional phase), whereas implementation intentions induce an implemental mindset associated with closed-mindedness (so far the only feature associated with the preactional phase). Hence, according to these findings, a deliberative and an implemental mindset can be activated within the preactional phase of goal pursuit depending on what self-regulation tool (i.e., implementation intentions or mental simulations, respectively) an individual chooses to apply.

In addition, in Studies 1 and 2, reaction times from stimulus onset (i.e., appearance of situational cues on the computer screen to which participants were asked to either find alternative situations or generate corresponding goal-directed behaviors) to the participants' initial pressing of the keyboard when generating means (i.e., situational opportunities or goal-directed responses) were measured. Implementation intention participants responded faster to the presented materials than did mental simulation participants. This finding was first of all interpreted as evidence of a stronger focus on previously specified means as part of forming implementation intentions as compared to engaging in mental simulations. Second, this result was construed as a possible indicator of the basic cognitive processes (i.e., activation levels of mental representations) that underlie the differential mindsets induced by implementation intentions and mental simulations, respectively. To address this question, two further studies measured activation levels of implementation intentions' and mental simulations' respective mental representations via a lexical decision task. Forming implementation intentions was found to result in heightened activation of the mental representation of situational cues (Study 3) and behavioral responses (Study 4), compared to mental simulation participants. This result was interpreted as evidence that differential activation levels of the mental representations of implementation intentions and mental simulations underlie the distinct information processing modes that these two self-regulation tools trigger (i.e., closed- versus open-mindedness, respectively).

The second line of research (Faude, 2005) presented in this chapter marks the first direct attempt to map out implementation intentions as knowledge structures (i.e., as cognitive representations of a specified situation and a goal-directed behavior linked in an if-then format) and the first direct test of simultaneous activation of the mental representation of both components of implementation intentions (i.e., the situational cue and the goal-directed response) upon formation of such plans. In three experiments, forming implementation intentions lead to shorter response times on a lexical decision task for situation- and behavior-words (i.e., the if- and then-components of the previously formed if-then plans), relative to neutral words and relative to a condition in which only a goal intention was activated. Implicating that the formation of an implementation intention (i.e., linking a situational cue and a goal-directed response in an if-then format) leads to a heightened co-activation of the mental representation of its both components, this finding was termed "the plan activation effect."

Specifically, in Study 1, self-generation of implementation intentions was found to result in heightened activation of both components (i.e., the cue and the response), compared to a condition in which no plans were generated. Studies 2 and 3 replicated the plan activation effect with assigned implementation intentions implying that the heightened activation is a result of a superior status of the if- and then-component (as part of an implementation intention), and not due to a generation effect of the components. The superior status of the components of if-then plans was further supported by Studies 2 and 3 where it was demonstrated that (a) assigning (i.e., activating) a goal intention only, without corresponding plans, did not suffice to activate certain goal facilitating situations and behaviors (rather, plan activation was contingent on assignment of implementation intentions in addition to an underlying goal intention), and that (b) the plan activation effect could be obtained under conditions of several plans competing for resources in the face of a shared goal. In addition, Studies 2 and 3 provided evidence that forming implementation intentions leads to heightened activation of the specified situation and the goal-directed behavior as a result of their functional relation (i.e., having been linked in an if-then format), rather than due to their semantic relation. Lastly, the results of Study 3 demonstrated that the plan activation effect could be reliably obtained under conditions of high cognitive load, implying that the activation of implementation intentions' components upon forming an if-then plan is due to an automatic process that does not require cognitive resources.

Together, the experiments demonstrate the following cognitive features of the mental representation of the anticipated situation and the goal-directed behavior as components of an implementation intention: (1) Both elements are cognitively represented as knowledge structures; (2) the formation of an implementation intention (i.e., linking the situation and the goal-directed behavior in an if-then format) enhances the co-activation of both components, thereby demonstrating a plan activation effect; (3) the heightened accessibility of implementation intentions' components is a result of (a) an automatic process due to their superior status, and (b) a functional relation between the components due to having been linked in an if-then format. The originality of these findings reside in the fact that they provide initial insights into the most basic processes by which implementation intentions promote goal attainment.

Planning via Implementation Intentions versus Mental Simulations

If implementation intentions and mental simulations both represent effective planning techniques that foster goal attainment, when is it advisable to use one or the other? Do both strategies lead to the same outcome (i.e., reaching one's goals) and are therefore interchangeable depending on, for example, a person's random or personal preference? Or does the effectiveness of each planning strategy vary depending on the respective circumstances (e.g., temporal) after having set a goal? Based on the differences we found in information processing (i.e., closed- versus open-mindedness) between if-then plans and mental simulations, we assume the latter. A deliberative mindset might be beneficial at the very beginning of planning goal-directed actions as it allows exploring best ways of how to achieve a desired goal. Once a decision on the best path towards a goal is made, the planning of goal-directed actions benefits from thoughts about when, where, and how to achieve the goal, as inherent in an implemental mindset. In other words: in the preactional phase individuals might benefit from a deliberative mindset at the onset of planning goal-directed actions and an implemental mindset in a second step of finalizing specific plans.

Imagine that you adopted the goal to lead a healthy lifestyle and so far have not paid a lot of attention to your health. When trying to achieve this goal, you would initially benefit from a deliberative mindset that allows you to imagine possible options on how to go about (e.g., exercise more, eat more vegetables, drink more water, get more sleep). Therefore, mentally simulating different steps of goal attainment would give you a good idea of what means are available and most likely beneficial to you (e.g., your engagements might not allow you to get more sleep, but you could easily exercise more). Once you are clear on your options on how to achieve your goal, your planning process would then benefit from an implemental mindset, as it would enable you to focus and decide on how to exactly implement your plan (i.e., exercise more by taking the stairs instead of the elevator or going to your gym more often). Hence, you can now further ensure goal achievement by forming an implementation intention, that is, by linking an anticipated suitable situation with an identified response in an if-then format (e.g. "If I find myself standing in front of an elevator, then I will choose to walk up the stairs"). Taken together, we suggest that mental simulation and implementation intentions benefit the process of goal striving at different points in time and should therefore be employed accordingly. However, further research is needed to systemically investigate this assumption.

In conclusion, this chapter highlights insights into motivational phenomena (i.e., goals and their means) that follow from a cognitive perspective on motivation (Gollwitzer & Baregh, 1994; Kruglanski, 1996; Shah & Kruglanski, 2000; Shah et al., 2002). Investigating the cognitive processes (i.e., mindsets and activation of mental representations) triggered by implementation intentions and mental simulations allows understanding how these two self-regulation techniques promote goal attainment. The findings afford new empirical and theoretical insights into the current understanding of (a) the beneficial effects of planning on goal striving in general, and of (b) the functioning of implementation intentions in particular. Besides the primary significance of the present research to understanding the functioning of implementation intentions and mental simulation, it has vast implications for the understanding of goal setting and goal implementation in general.

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