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What It Takes to Forgive: When and Why Executive Functioning Facilitates Forgiveness

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To establish what it takes to forgive, the present research focused on the cognitive underpinnings of the forgiveness process. We conducted four studies that examined and supported the prediction that executive functioning (a set of cognitive control processes) facilitates forgiveness. First, a correlational study revealed a positive relation between executive functioning and dispositional forgiveness (Study 1). Second, a longitudinal study demonstrated that executive functioning predicts the development of forgiveness over a period of 5 weeks after the offense (Study 2). Finally, two experiments examined when and why executive functioning facilitates forgiveness. Specifically, and in line with predictions, Studies 3 and 4 showed that executive functioning facilitates forgiveness only in the case of relatively severe (as compared with mild) offenses. Furthermore, Study 4 provided evidence for a psychological mechanism underlying the relation between executive functioning and forgiveness by demonstrating the mediating role of rumination about the offense. Implications of these findings for the literature on forgiveness and the role of executive functioning in interpersonal relationships more generally are discussed.

Keywords: forgiveness, executive functioning, cognitive control, self-regulation, rumination

What does it take to forgive an offending relationship partner? Sienna Miller, an actress, wanted to stay with her fiancé Jude Law after she discovered he cheated on her with the nanny. However, after Sienna declared that they were “working things out” (Lucy, 2006a, para. 4), she eventually ended the relationship. A friend of Sienna’s revealed that although Sienna wanted to make the relationship happen, “she can never put the pain of the affair completely out of her mind” (Lucy, 2006b, para. 5). Apparently, her motivation to stay with her fiancé was not enough to forgive him.

Forgiveness seems to be a key factor in understanding relationship functioning and stability (e.g., Fennell, 1993; Paleari, Regalia, & Fincham, 2005). For example, several studies have shown that forgiveness is associated with pro-relationship motivation and behavior (e.g., willingness to sacrifice), less relationship aggression, and greater relationship satisfaction (Fincham, Paleari, &

Regalia, 2002; Karremans & Van Lange, 2004; Maio, Thomas, Fincham, & Carnelley, 2008; Paleari et al., 2005). Moreover, the ability to forgive is related to psychological and even physical well-being (e.g., Karremans, Van Lange, Ouwkerk, & Kluwer, 2003; Witvliet, 2001). It is not surprising, therefore, that researchers have attempted to identify the factors that promote forgiveness. Previous research has predominantly focused on the motivational factors that facilitate forgiveness. For example, people are more motivated and willing to forgive an offending partner when they value the relationship with that partner to a greater extent. Specifically, high levels of closeness or commitment to an offender are positively associated with forgiveness toward that offender (Finkel, Rusbult, Kumashiro, & Hannon, 2002; Karremans & Aarts, 2007; McCullough et al., 1998). Variables that are related to the offense itself also influence the motivation to forgive. For example, if an offense is very severe, the motivation to forgive is reduced (e.g., Girard & Mullet, 1997; Worthington, 1998), whereas an apology by the offender promotes forgiveness (e.g., McCullough et al., 1998; McCullough, Worthington, & Rachal, 1997).

However, although being motivated sometimes—perhaps even oftentimes—may indeed lead to forgiveness, the motivation to forgive does not always equal actual forgiveness (i.e., the reduction of negative feelings and thoughts toward the offender reflected in the subjective experience of having forgiven an offender; Karremans & Van Lange, 2008). That is, although an individual may truly be motivated and willing to forgive an offending relationship partner (e.g., one’s spouse), sometimes this person may simply not succeed in doing so, still experiencing relatively low levels of forgiveness toward an offender (Worthington, 2005). As

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in the case of Sienna Miller, even though she wanted to maintain the relationship, in the end she apparently lacked the ability to forgive her fiancé.

In the present article, we argue that the examination of the factors that underlie a person's ability to forgive is crucial in fully understanding what it takes to actually forgive an offender. Although we do not wish to discard the important influence of motivational factors on forgiveness, we argue that motivational factors tell only part of the story. Specifically, we propose that forgiveness is facilitated by a person's level of *executive functioning*.

Executive Functioning and Forgiveness

Executive functioning refers to a group of cognitive control processes working together to regulate and shape behavior, thoughts, and feelings in a goal-directed manner (Borkowski & Burke, 1996; Denckla, 1996; Payne, 2005; Pennington & Ozonoff, 1996; Scholnick & Friedman, 1993). Often, different subcomponents, or *executive functions*, of executive functioning are postulated in the literature. Three major executive functions are inhibition, task switching, and updating (see, e.g., Miyake et al., 2000; Norman & Shallice, 1986). There is ongoing debate about the unity versus diversity of these different executive functions (for an overview, see Miyake et al., 2000). When the executive functions are described separately, inhibition is often defined as the ability to deliberately restrain from acting on automatic or dominant responses (Miyake et al., 2000); task switching is the ability to shift between several tasks, operations, or mental sets (Monsell, 1996); and updating is the coding and monitoring of relevant information in working memory (Morris & Jones, 1990). Despite these distinctions, it has been argued that the various executive functions include overlapping underlying processes. For example, one important underlying aspect of the different functions is that they all involve "focusing the attention on relevant information and processes, while inhibiting irrelevant ones ('attention and inhibition')" (Smith & Jonides, 1999, p. 1659; see also Cohen, Dunbar, & McClelland, 1990; MacLeod, 1991).

These underlying attention and inhibition processes are clearly apparent in inhibition tasks, because in these tasks one should inhibit an automatic, dominant response and focus the attention on a weaker but relevant process (Smith & Jonides, 1999). However, task switching also involves attention and inhibition processes, because it requires switching the focused attention from one task set to the other while inhibiting the irrelevant task set (Dove, Pollmann, Schubert, Wiggins, & von Cramon, 2000). Finally, updating also involves attention and inhibition aspects. Although updating is often thought to concern the storage of information in working memory, recently it has been argued that updating is mainly about using attention to maintain or suppress information (Barrett, Tugade, & Engle, 2004; Engle, 2002). Indeed, differences in working memory capacity predict whether individuals are able to shield their focused attention from distracting events or information (Barrett et al., 2004; Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008). As a result, working memory capacity predicts whether individuals are successful in regulating their own behavior, for example, by inhibiting an automatic response to eat M&Ms candy when one's goal is to refrain from eating sweets (Hofmann et al., 2008, Study 2). Thus, notwithstanding the differ-

ences between them, the underlying aspect that unifies the different executive functions is that they all include attention and inhibition processes.

These executive functions not only help in regulating everyday behavior like eating candies but also play an important role in successfully maintaining interpersonal relationships. Previous research on the effects of brain injury in the frontal lobe—the area of the brain where executive functioning is located (e.g., Miyake et al., 2000; Rabbitt, 1997; Stuss & Alexander, 2000)—has revealed severe consequences for the social skills and interpersonal relationships of the patients. For example, damage to the frontal lobe is related to impaired empathic ability (Eslinger, 1998; Grattan, Bloomer, Archambault, & Eslinger, 1994; Shamay-Tsoory, Tomer, Berger, & Aharon-Peretz, 2003), as well as a diminished sensitivity to the consequences of future actions (Bechara, Damasio, Damasio, & Anderson, 1994). Moreover, injury in the frontal lobe leads to problems in the regulation of social behavior (Cicerone & Tanenbaum, 1997; Eslinger & Damasio, 1985). These deficits have severe negative consequences for the quality of one's interpersonal relationships, often leading to relationship breakup. Indeed, spouses of patients with severe brain damage report lower marital satisfaction, less affection for the partner, and less marital cohesion (Gosling & Oddy, 1999; Peters et al., 1992). Another study showed that within six years of one spouse's frontal lobe injury, 55% of the couples got divorced (Tate, Lulham, Broe, Strettle, & Pfaff, 1989). In short, such findings suggest that executive functioning plays an important role in the maintenance of close relationships.

A vital predictor of the successful maintenance of a close relationship is how partners respond to one another "when the road gets rocky." In close relationships, it is inevitable that one gets hurt by one's partner from time to time. It seems only natural that an offense evokes immediate negative feelings, often accompanied by a desire to retaliate or to avoid the offender. However, people do not always respond in an eye-for-an-eye fashion but instead may respond in a forgiving manner. Such forgiving responses require the regulation and inhibition of negative responses. Indeed, forgiveness can be defined in terms of a transformation process in which negative feelings, cognitions, and motivations evoked by the offense are reduced and positive feelings, cognitions, and motivations toward the offender are restored (McCullough et al., 1998). We argue that executive functioning—and the attention and inhibition processes it entails—facilitates this transformation process of forgiveness by enabling one to regulate behavior, thoughts, and feelings related to the offense (Barkley, 1997; Friedman et al., 2007; Nigg, 2000; Pennington & Ozonoff, 1996).

Perhaps one important way in which executive functioning facilitates forgiveness is by reducing the amount of ruminative thoughts about the offense. Previous research has demonstrated that the down-regulation of negative thoughts about the offense is of crucial importance to be able to forgive an offender. Specifically, people who are more likely to ruminate about a past offense are less likely to forgive the offender. In contrast, when ruminative thoughts about the offense decrease, the formerly felt positive feelings toward the offending relationship partner can be restored (e.g., Kachadourian, Fincham, & Davila, 2005; McCullough et al., 1998; Paleari et al., 2005). It has been argued that this relationship between rumination and forgiveness may be due to the fact that individuals with a natural tendency to forgive do not feel the need

to ruminate in the first place. However, an alternative interpretation is that persistent rumination about an offense leads to a negative focus on the offense and the offender, thereby hindering forgiveness (Worthington, Berry, & Parrott, 2001; Worthington & Wade, 1999).

Good evidence suggests that executive functioning is inversely related to rumination (e.g., Watkins & Brown, 2002; Whitmer & Banich, 2007). For example, deficits in executive functioning are associated with repetitive, unintended thoughts about negative past experiences (Whitmer & Banich, 2007). These ruminative thoughts can, in turn, lead to an increased vulnerability to and maintenance of depression (e.g., Davis & Nolen-Hoeksema, 2000; Muraven, 2005; Watkins, Teasdale, & Williams, 2000). Moreover, recent research on older adults showed that deficits in executive functioning lead to a decreased ability to control ruminative thoughts, which in turn contributes to late-onset depression (von Hippel, Vasey, Gonda, & Stern, 2008). Such research findings suggest that when being offended and hurt by a relationship partner, executive functioning promotes the reduction of ruminative thoughts. Put differently, the core processes implicated in executive functioning may help a person to inhibit negative and repetitive thoughts about the offense and to shift his or her attention away from what happened. Hence, we propose that relatively high levels of executive functioning should be associated with relatively higher levels of forgiveness. This should, at least in part, be due to an enhanced ability to inhibit ruminative thoughts about the offender.

In addition to the question of why (or how) executive functioning facilitates forgiveness, another important question is when executive functioning facilitates forgiveness. We argue that if the ability to forgive indeed relies on cognitive control processes, executive functioning should be more predictive of forgiveness to the extent that the offense is more severe. That is, if executive functioning indeed is involved in facilitating the transformation of negative responses into more positive responses toward an offender (resulting in greater forgiveness), executive functioning should especially be helpful in forgiving offenses that evoke more negative thoughts and feelings toward the offender. A mild offense—for example, a partner not showing up for an appointment—is likely to result in fewer negative feelings and thoughts than a severe offense would, like a partner having an extramarital affair. If executive functioning indeed is associated with the ability to forgive, individual differences in executive functioning should therefore be related to forgiveness of such severe offenses and should be less associated with forgiveness of milder offenses.

Although there is no direct evidence for the role of executive functioning in the forgiveness process, previous research on the role of self-regulation in interpersonal functioning has provided some indirect evidence for this relation. Specifically, Finkel and Campbell (2001) demonstrated that high self-regulation facilitates responding constructively to a partner's negative act. In one of their studies, these researchers showed that self-regulatory resources predict to what extent participants respond in a constructive manner to a hypothetical transgression by the partner (e.g., talking about the offense in a positive way or letting it pass by with no hard feelings). Given that self-regulation is supposed to be tightly associated with executive functioning (Barkley, 2001; Baumeister, Schmeichel, & Vohs, 2007; Hayes, Gifford, & Ruckstuhl, 1996), it is likely that these findings are partly driven by

varying levels of executive functioning. Indeed, some previous researchers have—both explicitly and implicitly—argued that the effects of self-regulation in interpersonal functioning can be explained by people's executive functioning (e.g., Barkley, 2001; Baumeister et al., 2007). However, whether individual differences in executive functioning indeed are associated with forgiveness has not been tested empirically.

The Present Research

Following the reasoning outlined above, our main prediction was that individual differences in executive functioning would predict the ability to forgive. In addition, we examined when and why executive functioning facilitates forgiveness. Specifically, we hypothesized that the relationship between executive functioning and forgiveness would be more pronounced to the extent that the offense is more severe. Furthermore, we hypothesized that executive functioning would be related to less rumination regarding a past offense, which in turn would facilitate forgiveness.

The first study was designed to provide evidence for the general hypothesis that executive functioning is positively associated with forgiveness. Study 1 was of a correlational nature, designed to test the relationship between executive functioning and dispositional tendencies to forgive. In Study 2, we looked at the role of executive functioning in the trajectory of forgiveness over time. In this study, we selected participants who had recently experienced an offense and measured their level of executive functioning. We then monitored the subsequent forgiveness process on a weekly basis for five consecutive weeks. Finally, in Studies 3 and 4, we explored when and why executive functioning facilitated forgiveness. Both studies examined whether the association between executive functioning and forgiveness was more pronounced for severe as compared with mild offenses. We tested this in Study 3 by using naturally occurring differences in offense severity, whereas in Study 4 offense severity was manipulated by instructing participants to think of relatively mild versus severe offenses. Finally, in Study 4, we tested our prediction that rumination about the offense would function as a mediator in the relationship between executive functioning and forgiveness, thereby seeking to provide insight into underlying psychological mechanisms.

To examine the full breadth of the role of executive functioning in forgiveness, we used a variety of tasks that were originally designed to measure the previously described different executive functions, namely, updating, inhibition, and task switching. As explained above, although these executive functions are distinct, it has been convincingly argued that, in essence, they are all cognitive control processes that include attention and inhibition processes (e.g., Smith & Jonides, 1999). Because we reason that these are precisely the processes involved in forgiveness, an interesting question is whether each of the executive functions is predictive of forgiveness.

Study 1

To provide initial evidence for our main hypothesis, in Study 1, we first examined the association between executive functioning and dispositional tendencies to forgive. In this study, we measured the executive function of updating using a two-back task (Jonides et al., 1997). As in other executive functions (i.e., inhibition and

task switching), the essence of updating is cognitive control (see, e.g., Braver & Cohen, 2000).

Method

Participants. Forty-eight students (10 men, 38 women) with a mean age of 21.5 years ($SD = 3.49$) took part in this study. They were recruited by flyers distributed at the university and received €2 or course credit in exchange for their participation.

Procedure. In the first part of the study, dispositional forgiveness was measured with the Tendency to Forgive Scale (TTF; Brown, 2004). The TTF consists of four items and is designed to establish to what extent people respond in a forgiving manner when being hurt (e.g., "I tend to get over it quickly when someone hurts my feelings"; $\alpha = .73$). We regarded the TTF as a proxy for one's ability to forgive. Participants indicated their answers on a 7-point scale (1 = *totally disagree*, 7 = *totally agree*).

In the second part of the study, participants completed the two-back task (Jonides et al., 1997). The two-back task is often used as an indicator of executive functioning (e.g., Gevins & Cuttito, 1993). In this task, participants were presented with a series of letters, with 45 trials in total. For each trial, participants had to indicate whether the letter on the screen resembled the letter presented two trials previously. Participants were asked to press one designated key if the letter did not match (*a* on the left side of the keyboard) and another designated key if the letter did match (*6* on the number pad of the keyboard). In total, there were 14 matching letters and 31 nonmatching letters. Each letter was preceded by a blank screen for 1,500 ms, then the letter was presented for 500 ms, followed by a blank screen for 1,500 ms. Prior to the actual task, participants completed a practice block of 10 trials. During this practice block, participants got feedback about their responses. If they correctly responded to the letter within the limited timeframe, the word *good* was presented in green. If they incorrectly responded to the letter within the limited timeframe, the word *false* was presented in red. If they did not respond to the letter within the limited timeframe, the words *too late* were presented in red. After this practice block, the actual task started. The total number of correct responses on the two-back task served as an indicator of executive functioning ($M = 40.88$, $SD = 4.47$).

Results

There was a positive significant relation between performance on the two-back task and scores on the TTF, $r(48) = .31$, $p < .02$. These findings provided initial and promising support for our general hypothesis that executive functioning is related to the ability to forgive.

Study 2

In Study 1, we found a relation between executive functioning and general tendencies to forgive. Our goal in Study 2 was to extend these findings in several important ways. First, Study 2 explored the relation between executive functioning and forgiveness regarding a specific offense that had actually occurred in the recent past. Second, Study 2 examined the role of executive functioning in the forgiveness trajectory over time. Because we expected executive functioning to predict forgiveness especially

regarding severe offenses, we invited participants who had recently experienced a subjectively severe offense to take part in the study (for a similar procedure, see McCullough, Fincham, & Tsang, 2003).

Third, in Study 2, we examined the role of executive functioning in forgiveness by measuring executive functioning in a different way. Specifically, we did so using a task that involved both task switching and inhibition, namely, an adapted version of the Extrinsic Affective Simon Task (EAST; De Houwer, 2003; see also Koole & Jostmann, 2004; Voss & Klauer, 2007). Participants first completed this executive functioning task in the lab, after which we measured participants' level of forgiveness with online questionnaires over a period of five consecutive weeks. Thus, we examined whether their level of executive functioning at baseline (T_0) predicted greater forgiveness over time in these five weeks (T_1 – T_5). In doing so, we extended the role of executive functioning from general tendencies to forgive to forgiveness as it occurs in real life.

Method

Participants. One hundred eleven participants, mainly undergraduate psychology students, started participating in this study, of whom a group of 89 participants (13 men and 76 women) with a mean age of 20.82 years ($SD = 4.27$) completed all parts of the study. The analyses were performed over this final group of participants. The starting level of forgiveness at T_1 did not differ between participants in the final group ($M = 4.36$, $SD = 1.36$) and the dropouts ($M = 3.91$, $SD = 1.86$), $F(1, 109) = 1.67$, *ns*. All participants received €16 or course credit in exchange for their participation. Participants were recruited through flyers distributed at the university campus. These flyers indicated that people could only participate in this study if they were recently hurt by someone. The flyers were titled "Recently hurt?" and included the following text:

Everyone experiences moments where someone in your environment hurts you in one way or the other. Maybe you've been in a fight with your boyfriend or girlfriend this week, your best friend forgot your birthday, you discovered that someone gossiped about you, or something else made you feel hurt or upset. If this is the case: Participate in this study!

The offenses that participants had encountered happened, on average, three weeks before participants enrolled in the present study ($M = 2.99$ weeks, $SD = 1.98$).

Procedure. The study consisted of six parts. In the first part, participants visited the lab at the university. Our main aim in this part of the study was to measure participants' individual level of executive functioning at baseline (T_0). The task we used was a variation of the EAST (De Houwer, 2003) in which performance depends on both task switching and inhibition (see Voss & Klauer, 2007). The task consisted of three blocks of 30 trials. In each trial, an emotion word was presented on the screen, either in blue, in red, or in white (on a black background). If the word was presented in white, participants were to respond, as quickly and accurately as possible, by pressing a left designated key (*a*) if the word had a positive valence (e.g., *happy*) or by pressing a right designated key (*6* on the number pad of the keyboard) if the word had a negative valence (e.g., *angry*). However, if the word was presented in blue

or in red (i.e., task switching), participants had to ignore the content of the word (i.e., inhibition). Instead, their task was to respond to the color of the word by pressing the left designated key (a) if the word was presented in red or by pressing the right designated key (b) if the word was presented in blue. Each word was presented for 1,000 ms, which was also the timeframe within which participants had to respond, and was preceded by a fixation cross in the middle of the screen, which was presented for 100 ms. The words and colors were presented in random order.

Thus, in this task, participants had to constantly monitor the instructions (i.e., task switching) and had to control (and inhibit) their responses depending on the color (blue, red, or white) and content of the word. There is convincing evidence that tasks like these require executive control. For example, it has been demonstrated that similar brain regions underlie task performance on an EAST task and a Stroop task (Peterson et al., 2002). Participants completed this task after a 20-trial practice task. The overall number of correct trials across the three blocks of 30 trials served as our indicator of executive functioning ($M = 75.31$, $SD = 7.27$).

After they completed the EAST in the lab, participants were asked to complete the follow-up questionnaires at home, starting the same day. These questionnaires were completed online, and an e-mail reminder was sent to the participants each of the following four weeks. On the same day the executive functioning tasks were completed in the lab, participants completed an online questionnaire measuring general questions regarding the offense (e.g., a description of the offense, offense severity) and level of forgiveness toward the offender (at T_1). Over the next four weeks (i.e., T_2 – T_5 of the study), participants completed a similar questionnaire that included a measure of level of forgiveness. Participants indicated all of their answers to the questionnaires on 7-point scales (1 = *totally disagree*, 7 = *totally agree*).

At the start of the first part of the questionnaire, we asked participants to think back to the offense and to briefly describe it. An example of such a description was the following:

I was in a relationship with my boyfriend for three years. Since we were both not so happy in our relationship, we decided to take a temporary break. Although we did agree to stay faithful during this period, my boyfriend kissed another girl.

After describing the offense, participants noted when (i.e., how long ago) the offense happened. Perceived severity of the offense was measured with five items (e.g., “The incident was very serious”; $\alpha = .83$). As anticipated, offenses were perceived as relatively severe ($M = 5.40$, $SD = 1.07$). Notably, executive functioning was not related to the perceived severity of the offense, $r(89) = .11$, *ns*. Thus, any differences in forgiveness as a result of varying levels of executive functioning cannot be explained in terms of executive functioning being associated with the perceived severity of the offense.

Forgiveness was measured with a subscale of the Transgression-Related Interpersonal Motivations Scale (TRIM; for an extension of the scale, see McCullough et al., 1998). To minimize dropout, we wanted to keep the questionnaire as short as possible, using only the four items of the Benevolence subscale, which consists of four items measuring the positive dimension of forgiveness (e.g., “When I think about the incident, I still want us to maintain a good relationship”). For an overview of the mean forgiveness scores from T_1 to T_5 , see Table 1.

Table 1
The Means, Standard Deviations, and Alphas of the Forgiveness Scores From Time 1 to Time 5, Study 2

Time	<i>M</i>	<i>SD</i>	α
1	4.36	1.36	.81
2	4.65	1.40	.85
3	4.85	1.41	.86
4	4.94	1.51	.88
5	4.95	1.60	.91

At the end of each questionnaire, participants were thanked for their cooperation and reminded to complete the next part of the study next week. Exactly one week after they completed a questionnaire, participants received an e-mail with a link to the next questionnaire. This pattern continued until participants filled out all five questionnaires. After completing the last questionnaire, participants were thanked for their cooperation and effort. Finally, they were paid or the credits were assigned, and they were fully debriefed regarding the goals of the study.

Results

The process of forgiveness. We first examined how forgiveness, independent of executive functioning, unfolded over time. Using Mplus (Muthén & Muthén, 1998–2007), we first tested a linear model in which forgiveness linearly increased over time. This model did not optimally fit our data, $\chi^2(10) = 30.00$, $p = .001$, comparative fit index (CFI) = .956, root-mean-square error of approximation (RMSEA) = .150. To improve the fit of the model, we tested a quadratic model, which resulted in a good fit, $\chi^2(6) = 6.74$, $p = .345$, CFI = .998, RMSEA = .037. This model provided us with three variables: i (the intercept parameter), s (the slope parameter), and q (the quadratic parameter). The intercept parameter represents the mean starting point of forgiveness after the offense ($i = 4.36$). The slope parameter stands for the average mean change of forgiveness in one week ($s = 0.36$). Since the slope was positive, we can conclude that forgiveness levels generally increased over the weeks. The quadratic parameter describes the mean change of the slope parameter ($q = -.05$). The quadratic parameter was negative, meaning that the forgiveness curve showed a curvilinear trend. In other words, the level of forgiveness increased faster in the first few weeks after the offense than in the last weeks, resulting in a significant quadratic term (see the middle line in Figure 1).¹

The role of executive functioning in the development of forgiveness. Our main goal in this study was to test whether participants' individual level of executive functioning could sig-

¹ In two longitudinal studies, McCullough et al. (2003) showed that instead of a curvilinear trend, a linear trend best fit their data on the development of forgiveness. A possible explanation for this discrepancy is that, whereas McCullough et al. (2003) measured forgiveness once every two weeks (i.e., one, three, five, seven, and nine weeks after the offense), we measured forgiveness once every week (i.e., one, two, three, four, and five weeks after the offense). Possibly, the trend that fits the development of forgiveness best changes in accordance with the time forgiveness is monitored.

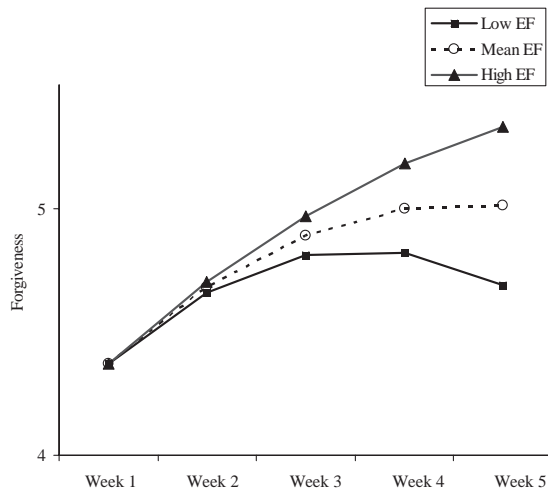


Figure 1. Development of forgiveness over five weeks as a function of individual differences in participants' level of executive functioning (EF; low EF, medium EF, and high EF), Study 2.

nificantly predict the development of forgiveness over five weeks. We expected participants with high scores on executive functioning tasks to go through the process of forgiveness more successfully, that is, to display steeper increases in forgiveness over time. Using executive functioning as a predictor for i , s , and q , we found a significant relation between the number of correct responses on the executive functioning task and the quadratic parameter, $\beta = .26$, $p < .05$. This means that for people who performed well on the executive functioning task, forgiveness increased steadily, in a linear way, over the subsequent five-week period. In contrast, however, for participants with a low score on the executive functioning task, we observed a quadratic curve, with increases in forgiveness gradually leveling off over the five-week period. This means that over the time period examined, these participants' levels of forgiveness developed more slowly and not to a similarly high extent as in the former group (see Figure 1).

To interpret these findings more specifically, we depicted the forgiveness trajectories for participants with relatively low (1 standard deviation below the mean) and relatively high scores (1 standard deviation above the mean) on the executive functioning task in Figure 1. Because initial levels of forgiveness were not associated with executive functioning—that is, executive functioning was not significantly associated with the intercept, $r(89) = .06$, ns —the figure represents differences in forgiveness over time as a function of executive functioning with the intercept held constant. The middle line represents the mean forgiveness line. The upper line represents participants with relatively high levels of executive functioning. This line is less quadratic than the mean line ($q = -.03$), indicating that the slope of the line only decreases to a small extent. In other words, for participants relatively high in executive functioning, the line is more linear, and forgiveness thus increases more steeply over time. The lower line represents participants with a relatively poor score on the executive functioning task. This line is more quadratic than the mean line ($q = -.07$), indicating

that although forgiveness increases initially, eventually the slope of the line decreases (or at least does not further increase).

To conclude, these findings demonstrate that people high in executive functioning display more linear increases of forgiveness over time, suggesting that over time they become more and more forgiving. In contrast, people with a low level of executive functioning seem to have difficulty increasing their level of forgiveness consistently over time. At some point, their level of forgiveness seems to get stuck, which is in line with our general reasoning that a lack of executive functioning may hinder forgiveness. More generally speaking, these findings suggest that, to some extent, time heals all wounds, but only for the subgroup of people with relatively high levels of executive functioning.

Study 3

In Studies 1 and 2, we found support for our main hypothesis that individual differences in executive functioning predict forgiveness. Our goal in Study 3 was to further examine this relationship by looking at the conditions under which the relationship between executive functioning and forgiveness would be strongest. More specifically, we examined the role of offense severity as a moderator. As noted in the introduction, if forgiveness indeed relies on cognitive control processes, we would expect that the relationship between executive functioning and forgiveness mainly exists for relatively severe offenses. Because the only participants who took part in Study 2 were people who had recently experienced a relatively severe offense, this study was less suitable to address the moderation by severity hypothesis. Therefore, in Study 3, we did not preselect participants but asked each participating individual simply to recall an instance in the past six months in which they felt hurt by their most significant other. In this way, we anticipated a wider range of offenses, including both relatively minor offenses and relatively severe offenses.

In Study 3, we examined individual performances on the two-back task, also used in Study 1, and the switching task as indicators of executive functioning (Rogers & Monsell, 1995). The switching task is specifically designed to measure task switching, which also is a task that requires executive control (see, e.g., Meiran, 2000).

As opposed to Study 2, in Study 3, we used all three subscales of the TRIM questionnaire (Benevolence, Avoidance, and Revenge) to measure forgiveness. Previous research has suggested that forgiveness is not unidimensional but instead consists of two dimensions: forgiveness, as measured by the Benevolence subscale, and "unforgiveness," as measured by the Avoidance and Revenge subscales (see, e.g., Fincham & Beach, 2002). By adding the Avoidance and Revenge subscales, we accounted for the unforgiveness dimension of forgiveness.

Additionally, we controlled for commitment toward the offender in Study 3. As briefly noted in the introduction, previous research has convincingly demonstrated that commitment toward the offender is an important determinant for people's inclinations to forgive an offender (e.g., Finkel et al., 2002; Karremans & Aarts, 2007; McCullough et al., 1998). We examined whether executive

functioning was associated with forgiveness above and beyond the effect of relationship commitment.²

Method

Participants. Seventy-nine students (16 men, 63 women) with a mean age of 21.57 years ($SD = 4.31$) took part in this study. They were recruited by flyers distributed at the university and received €2 or course credit in exchange for their participation.

Procedure. In the first part of the experiment, participants completed two tasks to measure executive functioning. In the first task, we measured task switching with the switching task (Rogers & Monsell, 1995). The task consisted of three blocks of 54 trials, 162 trials in total. In each trial, a number–letter combination was presented (e.g., 4M or U9). Depending on the place the combination appeared on the screen, participants had to respond to either the number or the letter in the combination. When the combination was presented in the upper part of the screen, participants had to respond to the number (they pressed the *a* key on the left side of the keyboard for an even number and the *6* on the number pad on the right side of keyboard for an odd number). When the combination was presented in the lower part of the screen, participants had to respond to the letter (they pressed left on the keyboard for a vowel and right on the keyboard for a consonant). The combination was presented for 2,000 ms; participants had to respond within this timeframe. If the participants correctly responded within 2,000 ms, the screen was blank for 150 ms, after which the next trial started. If the participants made a mistake or responded too slowly to the practice trials, a red cross appeared in the middle of the screen instead of a blank screen. Prior to the actual task, participants completed three practice blocks. Every practice block consisted of 40 trials. In the first practice block, a number–symbol combination was presented in the upper part of the screen, in which participants responded to the numbers. In the second practice block, a letter–symbol combination was presented in the lower part of the screen, in which participants responded to the letters. The final practice block resembled the actual task, because number–letter combinations were presented in the upper and lower parts of the screen. The actual task started after this last practice block. The overall number of correct trials served as indicator of performance on the switching task ($M = 134.28$, $SD = 23.79$). Next, participants completed the second executive functioning task. This was the two-back task, which we also used in Study 1. The overall number of correct trials served as our indicator of performance on the two-back task ($M = 42.29$, $SD = 2.27$).

In the second part of the study, we asked participants to think about the person whom they felt most committed to at the moment, like their partner or best friend. We reasoned that it would be easy for most people to think of an offense committed by a close other, because conflicts are quite common in close relationships. Subsequently, participants completed a six-item questionnaire measuring their level of commitment to the person they brought to mind (Rusbult, Martz, & Agnew, 1998; e.g., “I feel psychologically attached to the other”; $M = 6.32$, $SD = 0.74$, $\alpha = .83$).

Next, participants were asked to think back on an instance (no longer than six months ago) when they felt hurt or wronged by the person they brought to mind. The instruction was based on Karremans et al. (2003). Participants were asked to describe the offense. An example of a somewhat minor offense was “When I

went out with my friends, they invited someone they know I don’t like.” An example of a more severe offense was “My boyfriend cheated on me.” Perceived severity of the offense was measured with the same items used in Study 2 ($M = 4.32$, $SD = 1.34$, $\alpha = .85$). As anticipated, there was a wide range of severity of the offenses, from minor ($M = 1$) to severe ($M = 7$). Next, forgiveness regarding the offense was measured with the three subscales of the TRIM questionnaire. Besides the Benevolence subscale as used in Study 2, the Avoidance (e.g., “When I think about the incident, I want to keep as much distance between me and the other as possible”) and Revenge (e.g., “I want the other to get what he/she deserves, when I think about the incident”) subscales were added to the questionnaire. To create an overall forgiveness score, we recoded the scores on the Avoidance and Revenge subscales, such that higher scores indicate higher levels of forgiveness. The mean of these three subscales served as our indicator of forgiveness ($M = 4.81$, $SD = 0.54$, $\alpha = .92$). Participants indicated their answers on a 7-point scale (1 = *totally disagree*, 7 = *totally agree*).

Results

Because there was a moderately strong correlation between performance on the two-back task and the switching task, $r(79) = .44$, $p < .001$, we established a general indicator of executive functioning by averaging the *Z* scores of performances on the two tasks. To test our hypotheses, we performed a hierarchical regression analysis in which forgiveness was regressed onto executive functioning, severity of the offense, and the interaction between executive functioning and severity while controlling for commitment to the offender. The results of this analysis are shown in Table 2.

As can be seen, severity of the offense was negatively related to forgiveness, whereas commitment to the offender was positively related to forgiveness. These findings are in line with those of previous studies, showing that offense severity and commitment are important predictors of forgiveness (e.g., McCullough et al., 1998, 2003). More important than these simple correlations, however, is the revelation of a significant interaction between executive functioning and offense severity on forgiveness.³

The hypothesis that the executive functioning–forgiveness association would be moderated by the severity of the offense was

² We assumed that ability factors such as executive functioning would only come into play when one is, at least to some extent, motivated and willing to forgive the offender. Hence, in the current research, we asked participants to recall an instance when they were hurt or offended by the person they felt most strongly committed to, as strong commitment has been shown to be a major determinant of forgiveness (e.g., Finkel et al., 2002). Although, theoretically, motivational factors (such as commitment) and ability factors (such as executive functioning) may interact (we return to this issue in the General Discussion section), this issue is beyond the scope of the present article. The procedure used in these studies naturally resulted in a restriction of range regarding commitment (i.e., level of commitment greater than 6 on a 7-point scale), and interactions between commitment and executive functioning thus could not be tested properly.

³ When analyzing performance on the two executive functioning tasks separately, we found similar effects. There was a significant interaction between performance on the two-back task and offense severity on forgiveness, $t(78) = 2.95$, $p < .005$. The interaction between performance on the switching task and offense severity on forgiveness approached significance, $t(78) = 1.78$, $p = .08$.

Table 2
Regression Model Predicting Forgiveness With Executive Functioning and Offense Severity, Controlled for Commitment to the Offender, Study 3

Variable	<i>r</i>	Regression results		
		β	<i>F</i>	<i>R</i> ²
Executive functioning	.18 [†]	.16	9.50**	.34
Offense severity	-.23*	-.35**		
Commitment	.44**	.47**		
Executive Functioning \times Severity		.23*		

[†] $p < .07$. * $p < .05$. ** $p < .01$.

tested via moderated regression analysis (Aiken & West, 1991). Executive functioning served as the predictor variable, severity of the offense as the moderator variable, and forgiveness as the dependent variable. There was a significant interaction effect of executive functioning and severity of the offense on forgiveness, $F(3, 75) = 4.71, p < .01$. The explained variance of the main effects, $R^2 = .075$, increased significantly, $\Delta R^2 = .083$, when adding the interaction effect, $p < .01$. Furthermore, the pattern of the interaction effect is in line with the hypothesis. To illustrate this, Figure 2 displays the moderator effect with respect to forgiveness, which shows that the effect of executive functioning increases with increasing severity of the offense. Simple slope testing revealed that the high severe (i.e., 1 standard deviation above the mean) regression line was significant, $\beta = .59, p < .004$. Thus, with relatively severe offenses, higher levels of executive functioning indeed are associated with higher levels of forgiveness. Even though it seems like the effect reverses in the low severe (i.e., 1 standard deviation below the mean) regression line, this effect was not significant, $\beta = -.28, ns$.

To summarize, in Study 3, we found evidence for the hypothesis that executive functioning facilitates forgiveness. This was especially true regarding relatively severe as opposed to mild offenses.

Study 4

Study 3 provided good evidence for the role of executive functioning in forgiving relatively severe past offenses. In this final study, we wanted to extend these findings in several ways. First, since offense severity was measured with self-reports in Study 3, it could be that some individual differences in both executive functioning and evaluating offense severity may have partly accounted for the results. Hence, in Study 4, we systematically varied instructions such that each participant recalled both a severe and a mild offense and examined whether executive functioning was more strongly related to forgiveness of the severe offense as compared with the mild offense.

Second, in Study 4, we sought to provide insight into the psychological processes by determining how executive functioning facilitates forgiveness of relatively severe offenses. Put differently, in Study 4, we wanted to test why executive functioning promotes forgiveness. As discussed in the introduction, an important reason why executive functioning could facilitate forgiveness is that people who lack executive control are likely to have more ruminative thoughts about a past offense (e.g., Whitmer & Banich,

2007), which in turn would obstruct their ability to forgive the offender (e.g., McCullough et al., 1998). In contrast, relatively high levels of executive functioning would enable one to control one's negative thoughts about the offense, which in turn would facilitate forgiveness. To examine this prediction, we included a measure of rumination to test whether the relationship between executive functioning and forgiveness is mediated by rumination. As in Study 2, we used individual performances on the EAST as an indicator of executive functioning.

Method

Participants. Seventy participants (15 men, 55 women) with a mean age of 21.06 years ($SD = 2.83$) took part in this study. Participants were recruited by means of flyers distributed at the university, and they received €2 or course credit in exchange for their participation.

Procedure. In the first part of the experiment, participants completed the same task as was used in Study 2 (i.e., an adapted version of the EAST) to measure executive functioning. Again, the overall number of correct trials served as our indicator of executive functioning ($M = 75.31, SD = 7.27$).

In the second part of the study, participants, as in Study 3, were instructed to think about the person whom they felt most committed to. Commitment to the other was measured with the same commitment scale we used in Study 3 ($M = 6.30, SD = 0.84, \alpha = .88$). Subsequently, participants were instructed to think back to two different situations when they felt hurt or wronged by the person they brought to mind: a severe one and a mild one. The order in which participants were asked to think of the severe or mild situation was counterbalanced. The severe offense instruction asked participants to think back to the instance in which they felt

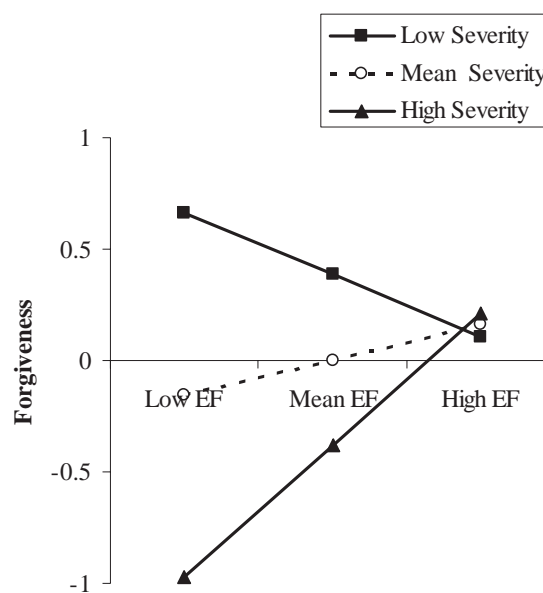


Figure 2. The conditional effect of varying levels of executive functioning (EF; low EF, mean EF, and high EF) on forgiveness, for offenses varying in level of severity (low severity, mean severity, and high severity), Study 3.

most intensely hurt by the other. After reading these instructions, participants briefly described the offense and reported the severity of the offense ($\alpha = .92$). An example of a severe offense was "After a two-year relationship, my boyfriend broke up with me without telling me why." Participants completed the same forgiveness scale as was used in Study 3 (i.e., the three subscales of the TRIM; $\alpha = .90$), as well as a measure of the level of rumination. The rumination questionnaire consisted of five items and was designed to measure the extent to which participants still have ruminative thoughts about the offense (e.g., "I often think about what happened"; "From time to time, I have ruminative thoughts about what happened"; $\alpha = .87$). Participants indicated their answers on a 7-point scale (1 = *totally disagree*, 7 = *totally agree*).

The mild offense instruction asked participants to think back to an instance in which they felt somewhat hurt by the other, but not very much. An example of a mild offense was "When I came home from work, my boyfriend was very grumpy. When I tried to tell him something personal, he did not respond at all." Again, participants briefly described the offense and rated the perceived severity of the offense ($\alpha = .88$) and level of rumination regarding the offense ($\alpha = .84$), as well as feelings of forgiveness toward the other ($\alpha = .89$). Again, participants indicated their answers on a 7-point scale (1 = *totally disagree*, 7 = *totally agree*).

Results

Offense severity. Our manipulation of offense severity was successful, as the severe offense indeed was reported as being more severe ($M = 5.16$, $SD = 1.68$) than the mild offense ($M = 3.41$, $SD = 1.37$), $t(70) = 9.88$, $p < .001$. In line with our hypothesis, we found a significant relation between performance on the executive functioning task and forgiveness regarding the severe offense, $\beta = .26$, $t(70) = 2.26$, $p < .03$. The relation between performance on the executive functioning task and forgiveness of the mild offense was not significant, $\beta = -.05$, $t(70) = -0.37$, *ns*. There was a significant difference between the correlation between executive functioning and forgiveness of the severe offense, and the correlation between executive functioning and forgiveness of the mild offense, $Z = -1.83$, $p < .03$ (one-tailed).

Participants reported lower forgiveness scores regarding the severe offense ($M = 5.50$, $SD = 1.34$) as compared with the mild offense ($M = 6.05$, $SD = 1.26$), $t(70) = -2.83$, $p < .01$. Additionally, participants reported having more ruminative thoughts about the severe offense ($M = 3.14$, $SD = 1.68$) than about the mild offense ($M = 2.18$, $SD = 1.34$), $t(70) = 5.27$, $p < .001$.

Mediation by rumination. An important goal of Study 4 was to test whether the executive functioning–forgiveness relationship was mediated by rumination about the offense. Therefore, we looked only at the severe offenses, because there was no relation between executive functioning and forgiveness in the mild offenses. If a variable, in this case rumination, is to mediate the relationship between executive functioning and forgiveness, three conditions must be met (Baron & Kenny, 1986). First, the predictor variable (executive functioning) must be associated with the outcome variable (forgiveness). This condition was met, as executive functioning significantly predicted forgiveness, $\beta = .26$, $t(70) = 2.26$, $p < .03$. Second, the predictor variable must be

associated with the mediator (rumination). This condition was also met: Executive functioning significantly predicted rumination, such that better executive functioning was related to lower levels of rumination, $\beta = -.24$, $t(70) = -2.02$, $p < .05$. Third, the effect of the predictor variable on the outcome variable must disappear when controlling for the mediator. Indeed, when we controlled for rumination, the effect of executive functioning on forgiveness disappeared, $\beta = .17$, $t(70) = 1.55$, $p > .12$. A Sobel test revealed that this was a significant reduction, $Z = 1.80$, $p < .04$ (one-tailed). Thus, in line with predictions, change (in this case, a decrease) in rumination indeed underlies the association between executive functioning and forgiveness.

General Discussion

In a series of four studies, we sought to shed light on the cognitive underpinnings of the forgiveness process. When a severe transgression occurs, individuals may have a difficult time forgiving their offending relationship partners. Although they might be willing and motivated to forgive the other to stay in the relationship, they might be unable to do so. In the present studies, we focused on this ability side of forgiveness by studying the cognitive control processes that might underlie forgiveness. The results of four studies provided strong evidence that executive functioning is associated with interpersonal forgiveness: Executive functioning is related to dispositional forgiveness (Study 1) and predicts forgiveness regarding past offenses (Studies 3 and 4), as well as the development of forgiveness over time for recently incurred severe offenses (Study 2).

Furthermore, Studies 3 and 4 explored when and why executive functioning predicts forgiveness. These studies revealed that severity of the offense is an important variable in answering the question of when executive functioning predicts forgiveness. More specifically, and in line with our expectations, executive functioning predicts forgiveness to the extent that the offense is perceived as severe. These findings are in line with the notion that the transformation of negative responses into positive ones involved in forgiveness is more difficult and requires more cognitive control for a very painful offense. In the case of a mild offense, it is easier to replace negative responses with the former positive ones, as the negative responses are less intense. Therefore, in those cases, executive functioning does not play an important role in predicting forgiveness.

Moreover, Study 4 addressed the question of why executive functioning predicts forgiveness. Specifically, Study 4 revealed the mediating role of rumination about the offense in the executive functioning–forgiveness relationship. Indeed, previous research has demonstrated that it is important to let go of ruminative thoughts about the offense to be able to forgive an offender (e.g., Kachadourian et al., 2005; McCullough et al., 1998). Because executive functioning is inversely related to rumination (e.g., Watkins & Brown, 2002; Whitmer & Banich, 2007), we argued that executive functioning facilitates forgiveness by enabling the down-regulation of negative thoughts and feelings and the reinstatement of positive responses. Our findings supported this reasoning, showing that rumination about the severe offense mediated the relationship between executive functioning and forgiveness. As in the example in the introduction, Sienna Miller could not put the pain of her fiancé's affair out of her mind. Perhaps she lacked the

cognitive control capacities to stop ruminating about the affair. These ruminative thoughts may very well have obstructed her ability to forgive, which eventually led to their final breakup.

In the present research, we used a variety of measures, including inhibition, task switching, and updating tasks, to test our main hypothesis. We found that, irrespective of the task we used, executive functioning was positively associated with forgiveness. This is in line with recent literature on executive functioning arguing that the different executive functions share two underlying processes, namely, inhibition and attention (e.g., Smith & Jonides, 1999). We reasoned that via these core processes, each of the different measures of executive functioning would facilitate forgiveness. However, the strength of using different measures of executive functioning at the same time might be regarded as a limitation. As noted, the tasks we used as indicators of executive functioning were originally designed to measure updating, inhibition, or task-switching ability, and the present research did not examine the relative and possible unique contributions of each executive function on forgiveness. Moreover, an interesting and related issue is whether these specific executive functions each contribute to the forgiveness process in their own way. Inhibition could, for example, enable one to suppress negative thoughts, behaviors, and feelings toward the offender, whereas task switching could facilitate the transformation from a negative to a more positive mindset and updating could aid in refreshing one's memory, replacing the painful memories of the transgression with recent, more positive experiences. Hence, an interesting issue for future research is to examine the possible unique contributions of updating, task switching, and inhibition on forgiveness and to examine the possible distinct processes by which each executive function affects forgiveness.

The present research findings help to foster a better understanding of how and why people are able to forgive an offender, and therefore it provides novel insights into what it takes to forgive. We outline several other implications of the present research. First, this research provided a new view on individual differences in the ability to forgive. Although we are not the first to have studied individual differences in forgiveness, research in the past has predominantly focused on the relationship between personality differences and general inclinations to forgive (notably, literature on the relationship between individual differences and offense-specific forgiveness is scarce). For example, it has been shown that people who are generally more (vs. less) inclined to forgive report less negative affect, such as depression, anxiety, and hostility (Mauger, Saxon, Hamill, & Pannell, 1996); are more empathic and less exploitative (Tangney, Fee, Reinsmith, Boone, & Lee, 1999); and are less narcissistic (Davidson, 1993; Tangney et al., 1999). Also, within the Big Five personality taxonomy (e.g., John & Srivastava, 1999), forgiveness is positively related to Agreeableness and inversely related to Neuroticism (McCullough & Hoyt, 1999). By examining the role of individual differences in executive functioning in forgiveness, we were able to provide more insight into the question of why some people may be better able to forgive than others. An interesting issue for future research would be to examine whether some of the individual differences previously found in forgiveness may perhaps partly be due to differences in executive functioning.

The present findings also have implications regarding the role of cognitive control processes and self-regulation in relationship

functioning and success (for an overview, see Vohs & Finkel, 2006). Several previous findings have suggested the beneficial role of self-regulation in relationship functioning. For example, participants performing a joint task with their romantic partner while their self-regulatory resources were depleted took more credit for joint success while they blamed the partner for joint failure more often than did participants whose self-regulatory resources were intact (Vohs & Baumeister, 2004). Additionally, participants with intact self-regulatory resources responded more constructively to hypothetical transgressions by their partner than did participants whose regulatory resources were impaired (Finkel & Campbell, 2001). The present research contributes to these findings by showing that individual differences in executive functioning as measured with low-level executive control tasks predict forgiveness in close relationships. Although it has been argued that decreases in self-regulation can be explained in terms of lack of executive functioning (Baumeister et al., 2007), the present research convincingly demonstrates that individual differences in executive control may indeed underlie pro-relationship responses.

Although the present research did not concern extremely severe offenses such as rape or other physical violence, the present findings may also have practical implications with regard to therapeutic settings in which people attempt to forgive an offender. Specifically, our findings suggest that cognitive control processes can affect whether a person is able to forgive an offender, especially to the extent that an offense is more severe. When people are willing to forgive but feel that they are not able to forgive an offender (e.g., because they keep thinking back to the offense), there may be ways to improve executive control, for example, through meditation, exercise in cognitive control, or self-affirmation processes (Baumeister et al., 2007). Improvements in executive control may facilitate increases in the ability to forgive, perhaps even regarding very severe offenses.

In the present research, we examined one possibility by which executive functioning promotes forgiveness, namely, by reducing rumination. Relatedly, executive functioning might also enable the forgetting of details of the offense or even the offense itself, which, in turn, could promote forgiveness. In the process of forgiveness, it might be useful to put the painful memories of the offense outside of awareness. Cognitive control processes enable people to control their memory (Anderson, 2001, 2003; Anderson & Green, 2001). More specifically, cognitive and neural systems facilitate the inhibition of automatic responses and, in this manner, can be used to override memory retrieval. This cognitive act, in turn, leads to memory failure (Anderson, 2005). Thus, executive control processes can enable people to intentionally forget unwanted memories.

It is interesting that recent neurophysiological evidence suggests that there is overlap in brain areas implicated in executive functioning (at least as measured with tasks similar to the ones used in the current study; i.e., areas in the prefrontal cortex and anterior cingulate cortex) and brain areas that are also implicated in the regulation of emotions (e.g., Beaugard, Lévesque, & Bourgouin, 2001; Goldin, McRae, Ramel, & Gross, 2008; Ochsner, Bunge, Gross, & Gabrieli, 2002; Ochsner & Gross, 2005). In other words, better functioning of these brain areas may not only lead to better performance on executive functioning tasks and executive functioning more generally but may also be associated directly with the ability to down-regulate negative emotions, for example, regarding

a past offense. Thus, the relation between executive functioning and forgiveness may be explained in terms of higher capacity in emotion regulation as well as in terms of decreases in rumination.

We should acknowledge a restriction of the present research. That is, we only examined the role of executive functioning in forgiveness in highly committed relationships. Previous research has demonstrated that high commitment is generally associated with relatively high levels of the inclination or willingness to forgive (e.g., Finkel et al., 2002; Karremans & Aarts, 2007; McCullough et al., 1998). Although beyond the scope of the current article (see also Footnote 3), it is possible that the willingness or motivation to forgive and the ability to forgive act in two stages that may ultimately lead to actual forgiveness. That is, in line with classic dual-process models (for an overview, see Chaiken & Trope, 1999), a person needs first to be motivated to forgive, after which the ability to forgive starts to play a role in the process. In other words, in low-commitment relationships, in which people are generally less motivated to forgive their offender, executive functioning will be less relevant in forgiveness: If there is no willingness to forgive, an individual also does not require the ability (i.e., executive control) to forgive. By examining the role of forgiveness only in highly committed relationships, we assumed a relatively high level of willingness to forgive. An interesting avenue for future research would be to more explicitly address the issue of whether forgiveness processes indeed involve such different motivation and ability processes and how they may interact by varying both the motivation and the ability to forgive.

Conclusion

Forgiving an offender can be difficult, even when one is truly motivated to do so. Consistent with our expectations, the results from the four present studies clearly demonstrated that executive functioning facilitates forgiveness, not only concurrently but also over time. It is important to note that executive functioning is primarily related to forgiveness in the case of a severe offense, when higher levels of executive functioning may lead to less ruminative thoughts about the offense, and in this indirect way facilitates forgiveness. With this, the current research sheds new light on the beneficial effect of cognitive processes on forgiveness and, we hope, on relationship success in general.

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