COGNITION AND EMOTION
2011, 25 (3), 478–489

Psychology Press
Taylor & Francis Group

Control of impulsive emotional behaviour through implementation intentions

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Past research has established that people can strategically enhance or override impulsive emotional behaviour with implementation intentions (Eder, Rothermund, & Proctor, 2010). However, it is unclear whether emotional action tendencies change by intentional processes or by habit formation processes due to repeated enactment of the intention (or both). The present study shows that forming implementation intentions is sufficient to modulate emotional action tendencies. Participants received instructions about how to respond to positive and negative stimuli on evaluation trials but no such trials were actually presented. Results showed that merely intending to approach and avoid affective stimuli influenced emotional action tendencies in a modified affective Simon task in which affective valence was irrelevant. An affective Simon effect (i.e., faster reactions when the valence of the stimulus corresponded with the valence of the movement) was observed when participants intended evaluations with affectively congruent responses (i.e., positive–approach, negative–avoid); in contrast, the effect was reversed in direction when participants planned evaluations with incongruent responses (i.e., positive–avoid, negative–approach). Thus, implementation intentions can regulate implicit emotional responses even in the absence of possible habit formation processes. Implications for dual-system accounts of emotion regulation are discussed.

Keywords: Approach and avoidance; Automated emotion regulation; Impulsive behaviour control; Implementation intention; Reflective–impulsive model.

Emotion regulation is typically conceived as an outcome of a tug-of-war or conflict between impulses on the one hand and intentional control on the other hand (Tice & Bratslavsky, 2000). On the one hand, emotions drive people to behave in a certain way, whether because of learning, innate tendencies, or inclinations. On the other hand, conscious control is exerted to tailor the emotional response to people's standards about what emotional response is appropriate. Illustrative examples are temptations that involve a conflict between a hedonic impulse (e.g., eating fatty food) and a standard to refrain from acting on this impulse (e.g., dieting). Other examples are anxiety regulation or controlling one's temper. In these situations, people have to resist emotional impulses in the pursuit of a valued, higher-order goal.

Dual-system models attribute such resistance to a deliberate (controlled, intentional, reflective, or explicit) route of action control that overrides

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http://www.psypress.com/cogemotion
DOI:10.1080/02699931.2010.527493

emotional impulses with executive control or "willpower" (e.g., Hofmann, Friese, & Strack, 2009; Metcalfe & Mischel, 1999). For instance, the reflective–impulsive model (RIM; Strack & Deutsch, 2004) proposes an impulsive system and a reflective system that interactively determine emotional reactions. The impulsive system directs behaviour by linking emotional stimuli to behavioural schemata through motivational orientations and learned associations. This system is fast and efficient, accounting for impulsive emotion behaviour. In contrast, the reflective system directs behaviour by activating behavioural schemata through behavioural decisions that are based on judgements of expectancy and value. This system is based on symbolic representations and operations that are slow, limited by processing capacity, and easily disrupted by other processes. In line with these assumptions, several studies have shown that impulsive reactions gain increasing control over behaviour when cognitive resources like executive attention and inhibitory control are depleted (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998; Hofmann, Friese, & Roefs, 2009; Richards, 2004).

Viewing emotion regulation as efforts to override or alter emotional impulses, dual-system models have traditionally emphasised conscious, deliberative, and resource-demanding processes in emotion regulation, such as conscious reappraisal (Koriat, Melkman, Averill, & Lazarus, 1972), strategic distraction (Boden & Baumeister, 1997), or effortful suppression of emotional responses (Richards & Gross, 2000). However, evidence is mounting that emotions can be also regulated at an implicit level without conscious awareness (Bargh & Williams, 2007; Jostmann, Koole, van der Wulp, & Fockenberg, 2005; Mauss, Bunge, & Gross, 2007). For instance, Mauss, Cook, and Gross (2007) found that priming people unobtrusively with emotional control words (e.g., stable, covered) leads to less anger experience in response to a laboratory anger provocation compared with people primed with words related to the full expression of emotions (e.g., volatile, boiled). Similarly, Williams, Bargh, Nocera, and Gray (2009) showed that unobtrusive priming of a reappraisal goal reduces emotional reactivity (as indexed by a change of heart rate) in an anxiety-eliciting task relative to a control group with neutral priming. In combination, these studies suggest that emotion-regulatory processes can also operate at an implicit level in the absence of deliberate control.

In addition to automatically reappraising the meaning of emotional stimuli before experiencing an emotion (an antecedent-focused strategy), people also regulate their emotions by strategically modifying their responses to emotionally evocative situations (a response-focused strategy; Gross, 1998). An effective means to modify responses to situational cues is to furnish goals with implementation intentions that additionally specify when, where, and how to pursue a goal (Gollwitzer, 1999; Gollwitzer & Sheeran, 2006). Specified in this way, implementation intentions are highly elaborated if–then plans that link a situational cue (e.g., *if* I see the bully approaching me) to a concrete goal-directed response (e.g., *then* I will run away). Evidence is accumulating that forming implementation intentions can control affective states (Parks-Stamm, Gollwitzer, & Oettingen, 2010; Webb, Ononaiye, Sheeran, Reidy, & Lavda, 2010). For instance, Schweiger-Gallo, Keil, McCulloch, Rockstroh, and Gollwitzer (2009) showed spider-phobics a series of images including ones depicting spiders. Participants were either given no instructions, asked to form goal intentions ("I will not get frightened!"), or asked to form goal intentions plus an implementation intention ("If I see a spider, then I will remain calm and relaxed!"). Findings showed that participants who formed implementation intentions reported less negative affect and had reduced psychophysiological arousal when confronted with spider stimuli compared to the other two groups. Thus, planning engendered more effective emotion regulation compared to forming mere goal intentions.

Implementation intentions in the format: "If the emotional Situation X is encountered, then I will perform Behaviour Y" might hence be an effective means to automatically override an impulsive reaction with an alternative response set. Eder, Rothermund, and Proctor (2010)

tested this hypothesis in respect to a strategic automation of approach and avoidance reactions. Many experimental studies have shown that people habitually tend to approach positive and avoid negative stimuli (see Elliot, 2008, for a review). For instance, when participants are instructed to respond to affective stimuli according to either a congruent (positive–approach, negative–avoidance) or incongruent mapping rule (positive–avoidance, negative–approach), responses are typically faster in the former than in the latter condition (e.g., Chen & Bargh, 1999). This effect is even observed when people are to respond with approach and avoidance to a stimulus feature other than valence (the so-called affective Simon task; De Houwer & Eelen, 1998), making a strong case for an unintended activation of approach and avoidance tendencies.

To test an automated control of approach and avoidance tendencies, Eder and colleagues (2010) intermixed an evaluation task, which explicitly linked affective valence to approach- and avoidance-related lever movements, with a Simon task, in which these responses were not directed to valence. In the evaluation task, behavioural intentions were induced with mapping instructions that were either congruent or incongruent with habitual approach and avoidance tendencies. Given that the participants employed these intentions in the mapping task routinely, in a frequent and consistent manner, a temporary association between affective valence and responses was hypothesised that potentiates habitual action tendencies in the Simon task in the case of congruent but that dampens, or even reverses, these tendencies in the case of incongruent intentions. The results were in line with these hypotheses. An enhanced affective Simon effect (i.e., faster responses when the valence of the stimulus corresponded with the valence of the movement) was observed when the prepared evaluation–action link was congruent with habitual approach and avoidance tendencies; in contrast, the affective Simon effect was reversed when the temporary link was incongruent to long-term response facilitations.

Making specific plans on how to respond to positive and negative stimuli thus seems to have a profound influence on implicit reactions to these stimuli. In the study of Eder et al. (2010), however, participants were not only instructed on how to respond to emotional stimuli, they also repeatedly enacted these intentions. Thus, it is possible that enactment of the intentional set is necessary to influence approach and avoidance tendencies effectively. In fact, a block analysis of Eder and colleagues showed that the reversed affective Simon effect increased linearly with practise of incongruent reactions in the evaluation task, whereas the positive Simon effect remained stable with intermixed congruent reactions. This result suggests that the intended behaviour must be repeatedly practised to override hedonic action tendencies effectively.

In line with this conclusion, several studies have shown that impulsive reactions can be changed with a massive (re)training of approach and avoidance reactions to selected stimuli. For instance, Wiers, Rinck, Kordts, Houben, and Strack (2010) trained heavy drinkers to avoid alcohol-related pictures with a lever push and to approach soft drinks with a lever pull. Results showed less actual beer consumption in a subsequent test-and-rate task among the participants trained to avoid alcohol as compared with controls who were trained to approach alcohol. Fishbach and Shah (2006) instructed participants to sort words that were related to the category "healthy" (e.g., apple, yogurt) or to the category "tasty" (e.g., cookie, fries) with a lever pull and push. When participants repeatedly approached healthy items and repeatedly avoided tasty items, they more frequently chose healthy rather than fatty food at the end of the experiment compared with a comparison group with the reverse movement assignment. Kawakami, Phills, Steele, and Dovidio (2007; see also Kawakami, Steele, Cifa, Phills, & Dovidio, 2008) investigated an influence of approach–avoidance training on interracial interaction. Participants who were trained to approach Black faces and to avoid White faces sat closer to and oriented their bodies more directly toward a Black confederate in a subsequent interaction task than participants who were trained to avoid Blacks. Finally, Huijding et al. (2009)

reported effects of training to approach or avoid novel animals on fear-related responses in children. After the training, girls reported more fear and avoidance of the pushed animal than of the pulled animal.

To sum up, several studies consistently show that (re)training approach and avoidance tendencies is an effective means to regulate impulsive emotional behaviour. From these studies, however, it cannot be concluded whether emotional action tendencies have changed by intentional processes or by habit formation processes due to repeated enactment of the intention (or both). The present research therefore tested whether forming an implementation intention alone is sufficient to alter emotional action tendencies effectively. Cognitive studies have demonstrated that stimulus–response instructions held in working memory can lead to autonomous response activation even when the response instructions were never practised (Cohen-Kdoshay & Meiran, 2009; De Houwer, Beckers, Vandorpe, & Custers, 2005; Wenke, Gaschler, & Nattkemper, 2007). On the basis of this research, one can expect that implementation intentions may analogously influence emotional action tendencies without practice.

EXPERIMENT

The present study examined whether planning approach and avoidance responses to affective cues is sufficient to modulate emotional action tendencies effectively. Participants received instructions about how to respond to positive and negative stimuli on evaluation-relevant trials but no such trials were actually presented. Instead, participants were asked to ignore the valence of the presented stimuli in a semantic task (animal vs. person) that required a speeded selection between approach- and avoidance-related lever movements that could match (compatible) or mismatch (incompatible) the valence of the stimuli (modified affective Simon task). For the evaluation task, one half of the sample received movement instructions that were congruent with hedonic action tendencies (i.e., positive–approach, negative–avoid); the other half received the opposite movement instructions (i.e., positive–avoid, negative–approach). Thus, different implementation intentions that specified when, where, and how to evaluate were induced with the evaluation rules in each group.[1]

I hypothesised that these intentional sets would influence automatic approach and avoidance tendencies in the evaluation-irrelevant trials: An affective Simon effect should be observed when the implementation intention is congruent with habitual action tendencies; in contrast, the affective Simon effect should be reversed in direction when the prepared evaluation–action link is incongruent with hedonic action tendencies. This interaction would provide strong evidence for the claim that approach and avoidance tendencies can be controlled with implementation intentions, that is, with temporary links between affective cues and goal-directed responses that are set up as a result of task instructions.

Method

Participants. One-hundred four students (67 women) were randomly assigned to the instruction conditions. Six participants did not correctly reproduce the affective mapping rules at the end of the session. Two participants responded randomly in the trials with reactions to the written response label words. The data of these participants were not analysed.

Apparatus and stimuli. Participants were seated at a distance of 60 cm from a 17″ VGA

[1] In contrast to general goal intentions ("I want to achieve *z*!"), implementation intentions additionally specify when, where, and how to pursue a goal ("When I encounter *x*, then I will perform behaviour *y* to achieve *z*!"). In the present research, evaluation represents the goal intention that was additionally furnished with implementation intentions that specify when (red border), where (picture content), and how (lever movement) to evaluate. With congruent and incongruent response instructions for the evaluation task, people thus prepare different sets of implementation intentions that link opposite responses to affective valence.

colour monitor with 70 Hz refresh rate. An IBM-compatible joystick was connected to the game port of the computer.

Response-imperative stimuli were 24 positive and 24 negative pictures, most of them selected from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005). Half of the pictures showed animals, the other half showed people. An additional 16 pictures (8 animals, 8 people) were used for task practice. The pictures were presented at the centre of the screen at a visual angle of about 11.2° (± 3.1°) in the horizontal and 11.4° in the vertical dimensions.

Procedure. Participants were randomly assigned to one of two instruction conditions. In the congruent-instruction condition, participants were instructed to evaluate pictures with affectively congruent pushing and pulling lever movements (i.e., positive–pull, negative–push); in the incongruent-instruction condition, participants received the reverse evaluation rule (i.e., positive–push, negative–pull). Importantly, participants were instructed to evaluate only pictures that had a red border but not pictures without a border. In latter case, picture valence was irrelevant and participants had to categorise them semantically (person vs. animal) as quickly as possible with pushing and pulling lever movements. The assignment of the lever movements to the person/animal decision was counterbalanced across participants.

In task instructions, a sample picture with a thick, red border (20 pixels) was shown to illustrate evaluation-relevant trials. Furthermore, great emphasis was put on a movement framing a pull "towards" the body (approach) and a push "away" from the body (avoidance). This movement framing was ingrained in 16 trials that required speeded reactions to the written response labels *HIN* (toward) and *WEG* (away) with a respective lever movement (cf. Eder & Rothermund, 2008). A practice block (16 trials) followed that presented exclusively pictures without a border. An additional 4 trials with reactions to written response label words were randomly interspersed to secure maintenance of the response meaning. After the practice block, participants were warned that, in the next block, pictures with a red border that needed to be evaluated would occasionally appear. They were also informed that a high number of fast and correct evaluations would be additionally rewarded with a bonus gratification. The experimental block consisted of 48 trials with picture presentations and an additional 12 trials with presentations of a response label word (6 toward, 6 away). Notably, all pictures were presented without a border. Thus, participants were prepared to evaluate red-bordered pictures but these pictures never appeared.

Each trial started with the presentation of a white fixation cross (200 ms), a blank period (100 ms), and a picture or a word that remained on the screen until movement registration. At the end of a trial, feedback was given on an incorrect lever position, a movement in a wrong direction, and on a reaction time above 1.5 seconds. The next trial started after 500 ms.

After the experimental block, participants were asked for the lever movements that were assigned to positive and negative evaluations, respectively, to probe for knowledge of the instructed affective mapping rules. Finally, participants were debriefed that pictures with a red border never appeared but that they nonetheless would receive the bonus (a chocolate bar).

Results

Analyses of trials with reactions to written response labels did not yield any differences between the instruction conditions and were not included in the analyses described below. Trials with erroneous lever movements (2.7% of trials) were discarded from reaction-time analyses. In addition, individual Tukey (1977) outlier thresholds were computed to identify response latency outliers; this truncation removed 1.7% of the reaction times.

Affective Simon effects were computed for each individual by subtracting mean performance (RT, error rate) in the compatible trials from performance in the incompatible trials (i.e., affective Simon effect = $M_{\text{incompatible}} - M_{\text{compatible}}$). To test the predicted influence of instructed mapping rules (i.e., implementation intentions) on

automatic approach and avoidance tendencies, affective Simon effects were compared for congruent and incongruent instruction conditions: An affective Simon effect was hypothesised for the group with congruent movement instructions; in contrast, a reversed affective Simon effect (i.e., faster reactions in incompatible trials than in compatible trials) was expected for the group that received affectively incongruent movement instructions. In addition, a block analysis explored the temporal stability of the intentional influence on the affective Simon effects.

Reaction times. Mean RTs and affective Simon effects are shown in Table 1. A mixed analysis of variance (ANOVA) with Valence–Movement Compatibility (compatible vs. incompatible) as within-subjects factor and Instruction Condition (congruent vs. incongruent) as between-subjects factor yielded no differences between the instruction conditions, $F < 1$. Valence–Movement Compatibility was not significant, $F(1, 94) = 1.57$, $p = .21$, but the interaction was, $F(1, 94) = 5.00$, $p < .05$, indicating an influence of instruction condition on affective Simon effects.

Planned comparisons of the means revealed that stimulus valence influenced the speed of compatible and incompatible lever movements in the congruent-instruction condition ($\Delta M = 18$ ms, Cohen's $d = 0.37$), $t(44) = 2.48$, $p < .05$. This influence was reversed in direction in the incongruent-instruction condition ($\Delta M = -5$ ms, $d = 0.10$), even though not reliably, $t(50) = -0.70$, $p = .49$. The absolute magnitudes of the Simon effects in both conditions were not different, $t < 1$. In short, a robust affective Simon effect was observed in the congruent-instruction condition, whereas the incongruent instruction failed to reverse the action tendencies significantly.

Block analysis. Affective Simon effects were analysed for a temporal decay of the evaluative action intentions in the course of the experiment. Figure 1 displays the mean effects collapsed across 16 consecutive Simon trials of the experimental block. In an ANOVA with Trial Block as within-subjects factor and Instruction Condition (congruent vs. incongruent) as between-subjects neither the linear trend of the block factor nor the interaction of the linear trend with the instruction condition reached significance, $F(1, 94) = 2.34$, $p = .13$, and $F < 1$, respectively.

Percentage errors. The pattern of lever movement errors corroborated the reaction time analyses reported above. As Table 1 shows, compatible responses were more frequently correct than incompatible ones in the congruent-instruction condition ($\Delta M = 0.4\%$); in contrast, this pattern was reversed to a relative facilitation of incompatible responses in the incongruent-instruction condition ($\Delta M = -0.4\%$). This pattern was, however, not significant in a mixed ANOVA, with all Fs < 1.

Table 1. *Mean response time (RT in milliseconds), mean percentage error (PE), and mean affective Simon effect as a function of instruction-condition and valence–movement compatibility (standard deviation in parentheses)*

	Affective S–R compatibility					
	Compatible		*Incompatible*		*Affective Simon effect*	
	RT	*PE*	*RT*	*PE*	*RT*	*PE*
Congruent instruction	756 (82)	2.3 (4.0)	775 (88)	2.7 (3.9)	18 (50)	0.4 (5.2)
Incongruent instruction	757 (86)	3.0 (3.8)	752 (85)	2.6 (3.4)	−5 (53)	−0.4 (4.2)

Note: Small differences in numbers are due to rounding.

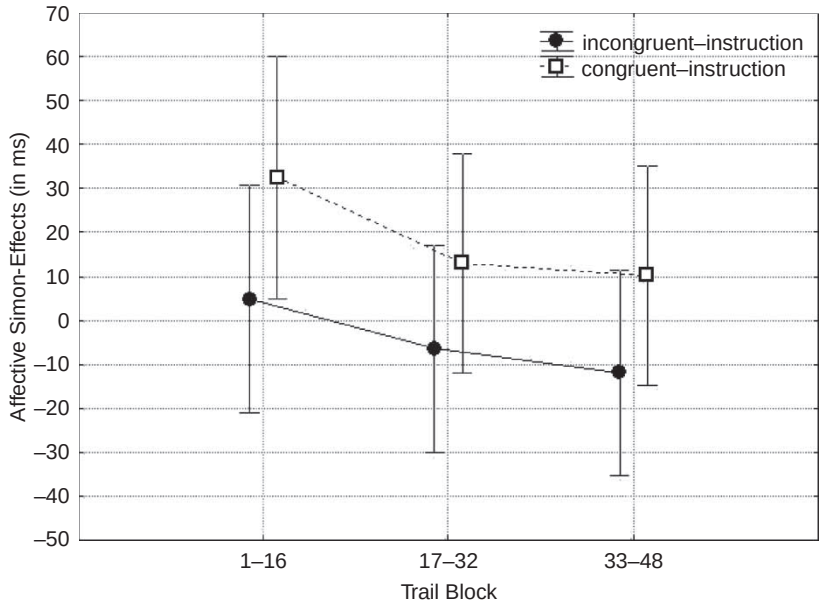

Figure 1. *Mean affective Simon effects in the instruction conditions collapsed across 16 consecutive trials. Error bars display the 0.95 confidence interval.*

Discussion

The present study examined whether merely forming implementation intentions is sufficient to regulate impulsive emotional behaviour. Participants received instructions about how to respond to affective stimuli on evaluation-relevant trials but no such trials were presented. Results show that implementation intentions in the format "If the picture has a red border and is positive (negative), then I will push (pull) the lever" influence affective response tendencies in a modified affective Simon task, in which affective valence was irrelevant: An affective Simon effect (i.e., faster responses when the irrelevant valence of the stimulus corresponded with the valence of the movement) was observed when the implementation intention was congruent with habitual affective response tendencies (i.e., positive–pull, negative–push). In contrast, this effect was non-significantly reversed in direction when the prepared evaluation–action link was incongruent to hedonic action tendencies (i.e., positive–push, negative–pull). A block analysis additionally showed that the influence of the implementation intentions on affective response tendencies was temporally stable over a limited set of trials. Thus, implementation intentions have changed implicit emotional responses in the absence of possible habit-formation processes.

Even though the present results provide support for the idea that people can selectively enhance or override emotional action tendencies with implementation intentions, it should be noted that the present study is not conclusive in respect of whether these intentions are more effective than other, more general, regulatory goals. Such superiority was, however, reported by Schweiger-Gallo and colleagues (2009), who observed that control goals furnished with implementation intentions engender more effective emotion regulation compared to forming mere goal intentions. Furthermore, previous research has shown that affective Simon effects occur even when participants are explicitly asked to ignore the affective meaning of the presented stimuli (De Houwer & Eelen, 1998). Thus, it seems unlikely that unspecific control goals could have produced the same effects as observed in the present study.

What are the cognitive processes underlying the effect of implementation intention on emotional action tendencies? One possibility is that the intention effect results from a congruency relation on a purely semantic level. According to this account, valence activates a response meaning on an abstract level that can either match or mismatch the meaning of the response required from the semantic decision. Even though a semantic account can explain the present findings, theoretical and empirical reasons argue against the underlying assumption that the meaning of an intended response can be activated without activating the response itself. In fact, cognitive and neuroscientific research on action control has accumulated much evidence that conceptual action knowledge used to organise goal-directed movements becomes an integral part of these motor representations (e.g., Eder & Klauer, 2009; Lindemann, Stenneken, van Schie, & Bekkering, 2006; van Elk, van Schie, & Bekkering, 2010; Wenke & Frensch, 2005). In line with this research, Eder and Rothermund (2008, Experiment 5) showed that an evaluative congruency relation between affective stimuli and written movement labels (*toward* and *away*) engendered a congruency effect only when lever movements enacted the labels but not when lever movements were unrelated to the label words. Thus, an evaluative match with a response meaning on a purely symbolic level was not sufficient to engender affective congruency effects in this study, suggesting that activation of conceptual action knowledge is closely tied to action control processes.

A more plausible explanation for the present findings is that implementation intentions increased the accessibility of the plan components and forged an association between the specified situational cue and the intended response (Webb & Sheeran, 2008). In the present study, forming an intention to implement lever movements as responses to the affective content of red-bordered pictures might hence have made the affective picture content more salient, even in trials in which valence is irrelevant for the task at hand. However, enhanced processing of affective valence alone cannot account for the reduced effect in the instruction-incongruent condition. To explain this observation, one has additionally to take the specific stimulus–response association into account that was set up as a result of the evaluative task instruction. By forging a temporary link between affective cues and approach- and avoidance-related movements, control of the intended response is delegated to the anticipated affective cue, allowing the response to be initiated automatically without a proximal intention to do so. Intentionally configured in this way, affective valence primes affectively congruent responses in the instruction-congruent condition but affectively incongruent responses in the instruction-incongruent condition, enhancing habitual action tendencies in the former condition but overriding them in the latter condition.

By specifying in advance (antagonistic) behavioural reactions to an anticipated emotional event, people can hence strategically switch from conscious and effortful control of their affective reactions to being automatically controlled by selected affective cues. For instance, a mother who has formed the goal to educate her trouble-making child can furnish this goal with an implementation intention that specifies when (e.g., when the child comes home from school), where (e.g., at a quiet place), and how to respond emotionally (e.g., making a firm and stern impression). Similarly, anxious people who have formed a goal to regulate their anxiety can specify in advance concrete behavioural reactions to an anxiety-eliciting situation to cope with their anxiety (see, e.g., Webb et al., 2010). Thus, one can think of many emotionally evocative events that are predictable and regularly encountered and that allow for a strategic control with implementation intentions.

Accordingly, people do not always have to control their affective reactions deliberately and consciously in emotional situations. By strategically forming if–then plans, the implementation of emotion regulation can instead be placed under the direct control of affective cues, with intentional processes setting the stage for an automated control of emotional action. According to this view, automatic responding to emotional stimuli

originates in a conscious "act of will", rejecting a categorical distinction between automatic processes on the one hand and controlled processes on the other hand.

EMOTION REGULATION: FROM DUAL SYSTEMS TO INTERACTING SYSTEMS

To account for an intentional configuration of automatic processes, dual-system models consequently have to allow for some sort of interaction between implicit and explicit routes of emotion regulation. The RIM, for instance, might localise the formation of implementation intention in symbolic operations of a reflective system that link a situational cue (if-element) to a goal-directed response (then-element) on the basis of task instructions and action goals. However, once these elements were intentionally linked to in preparation for action, a short-term association is created that is subject to associative activation just like any other type of association. As a result, the specified opportunity might elicit the prepared response in an automatic fashion just like their more permanent counterparts—operating like a "prepared reflex" (Hommel, 2000).

With intentionally configured short-term associations, the reflective system thus might "recruit" the impulsive system for automatic goal striving. This theorising has several implications that go beyond a mere redescription of known facts. For instance, the RIM assumes that the cognitive procedure of negating (i.e., reversing the truth value of a proposition) can only be implemented in the reflective system but not in the associative store of the impulsive system. After translation into a short-term association, implementation intentions implying a negation (e.g., "If the bully is approaching me, then I will *not* run away") should consequently even increase a tendency to execute the negated response under mental load, ironically producing the very emotional outcome that people intend to avoid (e.g., Dalgleish, Yiend, Schweizer, & Dunn, 2009; Wegner, Broome, & Blumberg, 1997; Wegner, Erber, & Zanakos, 1993; see Wegner, Ansfield, & Pilloff, 1998, for ironic outcomes in action control).[2]

In addition to an ineffectiveness of negations in a condition in which effortful control is compromised, a number of other boundary conditions can be deduced from this theoretical approach. First, given a temporary association between if–then elements, activation of one element should automatically spread to the other element of the associative link. In consequence, elements are expected to activate the intention even when the specified release condition is only partially met. In fact, in the present research participants were instructed to evaluate only pictures with a red border but not pictures without a border. Despite these clear task instructions, the affective mapping rules influenced reaction performance in evaluation-irrelevant trials, suggesting that affective valence activated the prepared response even though the release condition was not fully met.

Second, activation of the overt behavioural response should depend on the relative strengths of intentionally configured short-term associations and pre-existing long-term associations. As a result, short-term associations must compete against long-term associations in the case of incongruent intentions but not in the case of

[2] Note that this prediction applies only to withholding a negated behavioural response but not to other types of inhibitory control like resistance to distracter interference, selective attention, and global response suppression (Friedman & Miyake, 2004; Hofmann et al., 2009). In fact, evidence is available that in selective-attention conditions temptation-inhibiting intentions (e.g., "If I encounter a distraction, then I will ignore it!") are even more effective than task-facilitating intentions (e.g., "If I encounter a distraction, then I will focus harder on the task!") to resist distractions (Parks-Stamm et al., 2010; Patterson & Mischel, 1976; see Gollwitzer, Bayer, & McCulloch, 2005, for an overview). Furthermore, people can strategically switch from an intention specifying a negated unwanted response (e.g., "If I see a TV ad, then I will not look at it") to one specifying a wanted response (e.g., "If I see a TV ad, then I will switch the TV channel"). Thus, multiple regulatory strategies exist to cope with unwanted behavioural tendencies, and researchers should carefully distinguish between different types of control functions when evaluating the hypothesis of ironic control effects.

congruent ones, suggesting that overriding habitual responses is more difficult than enhancing them (see, e.g., Webb, Sheeran, & Luszczynska, 2009). In line with this expectation, the incongruent-instruction condition failed to reverse the Simon effect reliably in the present study, whereas the congruent-instruction condition engendered a robust affective Simon effect. Incongruent links between affective valence and behavioural responses thus may require additional strengthening through enactment to override habitual action tendencies effectively (cf. Eder et al., 2010).

Third, the transient link between the specified opportunity and the intended response should be maintained as long as the relevant goal underlying the intention is active (cf. Sheeran, Webb, & Gollwitzer, 2005). In line with this hypothesis, the block analysis of the present study did not yield evidence for a temporal decay of the intentional link, suggesting that the evaluation–action link was stable as long as the underlying evaluation goal was active. However, as soon as the relevant goal no longer exists, the prepared association should be subject to decay, terminating its influence on action initiation.

Fourth, intentionally created links between opportunities and goal-directed actions should become stronger and more stable when used routinely, in a frequent and consistent manner. In consequence, the temporary association might become consolidated in long-term memory with repeated use, transforming the prepared response into a habitual response that is automatically elicited by a supporting goal context (Aarts & Dijksterhuis, 2000; see also Tagliabue, Zorzi, Umiltà, & Bassignani, 2000).

To conclude, a number of testable hypotheses can be derived from the idea that implementation intentions forge a temporary association between selected opportunities and the specified response. Based on this associative structure, implementation intentions can drive behaviour in an automatic fashion, instigating automatic action tendencies on their own. Conceptualised in this way, an automated control of impulsive emotional behaviour can be meaningfully integrated into a dual-system framework to build a more comprehensive model of emotion regulation.

Conclusions

Dual-system accounts of emotion regulation have traditionally emphasised conscious and effortful control modes that override impulsive emotion reactions. The present article argues that people can also regulate emotions automatically when regulatory goals are furnished with implementation intentions that temporarily link affective cues (e.g., *if* the guy is insulting me again) to concrete behavioural reactions (e.g., *then* I will leave the room). Results of an experiment showed that merely intending to approach or avoid affective stimuli modulated spontaneous action tendencies, suggesting that implementation intentions are an effective means to regulate emotional responding. Thus, people do not always have to control their affective reactions deliberately and consciously when in an emotionally evocative situation; by forming implementation intentions, they can instead strategically switch from conscious and effortful control of their affective reactions to an automated control by selected affective cues.

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