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How farsighted are behavioral tendencies of approach and avoidance?

The effect of stimulus valence on immediate versus ultimate distance change

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Abstract

Research suggests that affective stimuli facilitate behavior that causes a compatible change in distance (i.e., approach positive and avoid negative stimuli). In natural settings, however, behavior often causes different consequences at different points in time. It is unclear whether affective stimuli interact with immediate or ultimate action-consequences (i.e., consequences that are more removed in time). To shed light on this, we tested whether stimulus valence facilitates behavior that ultimately causes a compatible change in distance, even when this behavior immediately causes an incompatible distance change. Participants moved a manikin on a computer screen toward or away from a positive or negative word. On half of the trials, moving the manikin ultimately in one direction required an initial movement in the opposite direction. Results from two studies showed that stimulus valence facilitated ultimate-compatible distance change regardless of the initial direction. This suggests that affective stimuli facilitate behavior that is relatively farsighted.

Keywords: approach avoidance, distance change, action effect, evaluation, automatic

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How farsighted are behavioral tendencies of approach and avoidance?

The effect of stimulus valence on immediate versus ultimate distance change

Research from diverse areas of psychology suggests that organisms are endowed with mechanisms that automatically regulate behavior towards positive objects and away from negative objects (e.g., Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Dickinson & Dearing, 1979; Gray, 1994; Lang, Bradley, & Cuthbert, 1990; Strack & Deutsch, 2004). In line with this notion, numerous studies have shown that positive stimuli facilitate approach and negative stimuli facilitate avoidance (for an overview, see Neumann, Förster, & Strack, 2003). Whereas some argued that approach and avoidance responses involve different fixed muscular patterns (e.g., flexing versus extending the arm; Cacioppo, Priester, & Berntson, 1993; Chen & Bargh, 1999), others put forward the idea that the action-consequences in terms of distance change (*DC*) are crucial. An increasing number of studies support the latter hypothesis (Markman & Brendl, 2005; Seibt, Neumann, Nussinson, & Strack, 2008). Specifically, positive stimuli facilitated behavior that caused a decrease in distance whereas negative stimuli facilitated behavior that caused an increase in distance, irrespective of the specific motor response (i.e., flexing or extending the arm). This suggests that the cognitive interpretation of a response in terms of its distance changing effects determines whether a behavior is represented as approach or avoidance.

The latter observation implies that there is some flexibility in which concrete behaviors are facilitated by positive or negative stimuli. This is of great importance because distance-regulating behaviors at times include sequences of distance change that contradict the super-ordinate goal. Imagine standing in front of a bakery and seeing your favorite chocolate cake through the window. Successfully decreasing the distance to the cake necessitates increasing the distance first by leaving the window and entering the bakery through the door. Does this appetitive object facilitate immediate approach – a behavior that would cause you to bump into the window (immediate DC)? Or does the appetitive object facilitate behavior that ultimately leads to approach in the given situation, even though this requires initial withdrawal (ultimate DC)? In short, the present work aims at answering the question whether affective stimuli facilitate responses that lead to immediate-compatible or ultimate-compatible DC.

Empirically, findings highlighting that the representation of the behavior in terms of DC determines its compatibility with valence (Markman & Brendl, 2005; Seibt et al., 2008) imply that compatibility effects should occur with respect to ultimate DC as long as the behavior is cognitively represented as such. Relevant theories, however, make less clear predictions for this situation because they do not make specific assumptions about the interplay of immediate and ultimate DC or the automaticity of the underlying processes. Nevertheless, in what follows we describe relevant theories and discuss possible predictions. First, research on self-regulation suggests

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that emotional stimuli trigger responses that are controlled by immediate rather than long-term consequences (e.g., Metcalfe & Mischel, 1999; Strack & Deutsch, 2004). At the same time, such theories do not specify the exact temporal scope of automatic processes and thus cannot predict whether an event that occurs, say, 5 s after an action is already too far away to determine the action in an automatic fashion. Second, Lewin (1935) proposed that valenced objects act like forces that pull and push individuals towards and away from them, respectively, suggesting that stimulus valence triggers immediate-compatible DC. However, he further theorized that this immediate influence would decrease if the perception of the situation changes such that the single steps of the action sequence are represented as a unified action. Yet, he did not specify whether stimulus valence would facilitate ultimate-compatible DC under such conditions.

Third, Lang et al.'s (1990) model suggests that an approach or avoidance motivation can give rise to different specific behaviors, depending on the specific context (cf. Strack & Deutsch, 2004). In particular, "(…) action dispositions are organized around two strategic dispositions, appetitive/preservative and defensive/protective, that define broad motivational end goals that facilitate survival." (Lang & Bradley, 2008, p. 53). Specific actions, however, are context-dependent. For instance, the motivation to escape from aversive stimuli could lead to flight (i.e., immediate distance increase) or fight (i.e., immediate distance decrease). This reasoning may suggest that affective stimuli facilitate responses that are ultimately (but not necessarily immediately) followed by a desired DC. However, Lang and colleagues did not specify how a motivational disposition is translated into specific actions and the extent to which this occurs automatically.

Finally, the evaluative coding account explains compatibility effects of distance regulating behavior and valenced stimuli by the evaluative congruency of stimulus and response representations (Eder & Rothermund, 2008; Lavender & Hommel, 2007). This account assumes that labeling a behavior as approach attaches a positive code to its representation and labeling it as avoidance attaches a negative code to its representation. How a behavior is labeled is mainly determined by the task instructions. In addition, participants may change the labels if this helps to simplify the task. In cases where immediate and ultimate consequences of behaviors dissociate, compatibility effects should fully depend on whether participants label the actions in terms of immediate or ultimate effects (cf. Hommel, 1993). Therefore, predictions derived from this account heavily depend on the procedural characteristics of the task (i.e., task instructions and ways of simplifying the task by changing the action labels).

Taken together, different theoretical perspectives give different and at times unclear answers to the question whether affective stimuli facilitate ultimate-compatible or immediate-compatible DC. From this perspective, empirically addressing this question is an important task. To do so, we employed an approach-

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avoidance stimulus-response-compatibility (SRC) task (Chen & Bargh, 1999; Krieglmeyer & Deutsch, 2010). In these tasks, participants are asked to respond to valenced stimuli as quickly as possible in a compatible (i.e., approach positive and avoid negative stimuli) versus incompatible way (i.e., avoid positive and approach negative stimuli). For instance, participants might be asked to move a stick figure ("manikin") presented on the screen towards positive and away from negative stimuli or vice versa by pressing keys on a keyboard (Mogg, Bradley, Field, & De Houwer, 2003). Faster responses in compatible relative to incompatible trials indicate that stimulus valence automatically facilitated compatible approach-avoidance responses. Because automaticity is not an all-or-none property of psychological processes one needs to specify in what sense the process under investigation is automatic (Bargh, 1992; Moors & De Houwer, 2006). Effects from approach-avoidance SRC-tasks indicate that the impact of valence on approach-avoidance responses is automatic in the sense of unintentional (i.e., in the absence of the goal to let valence influence the responses) and relatively fast (response latencies are typically shorter than 1s). Furthermore, because participants' task goal is to respond as quickly as possible, the impact of valence on approach-avoidance responses can also be described as automatic in the sense of uncontrolled (i.e., in the presence of the goal to prevent the impact of valence on approach-avoidance responses; see Moors & De Houwer, 2006, for an analysis of automaticity features). For our purposes, we modified the approach-avoidance task designed by Mogg et al. (2003) such that the ultimate DC between the stimulus and the manikin was varied independently from the immediate DC.

Experiment 1

In Experiment 1, we manipulated ultimate DC by means of "normal" and "magic flying carpets". On each trial of the approach-avoidance task, a manikin appeared flanked by either normal or magic flying carpets. Normal flying carpets were carpets that continued to move in the same direction as the initial movement of the manikin. For instance, when the manikin stepped on the left carpet it moved to the left. Magic flying carpets were carpets that moved in the opposite direction. For instance, when the manikin stepped on the left carpet it moved to the right. Thus, on trials with magic carpets immediate DC was opposite to ultimate DC. The type of the carpet was indicated by its color. Participants completed two blocks of trials. In the ultimate-compatible block, they were instructed to step with the manikin on that carpet that ultimately transported it towards positive words and away from negative words. In the ultimate-incompatible block, they received the reverse instructions. On trials with normal carpets, we expected participants to respond faster in the ultimate-compatible block than in the ultimate-incompatible block. The critical trials were the magic-carpet trials. If stimulus valence facilitates ultimate-compatible responses then responses would be faster on ultimate-compatible magic-carpet trials than on

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ultimate-incompatible magic-carpet trials. However, if stimulus valence facilitates immediate-compatible responses then the effect would be reversed on magic-carpet trials.

Method

Participants. Seventy-two students (41 women and 31 men) at the University of Würzburg participated in exchange for a chocolate bar. Their mean age was 21.9 years (*SD* = 2.8 years). Two participants were excluded because their error rate deviated more than 2.5 standard deviations from the mean error rate.

Materials. We used 32 positive and 32 negative nouns as test stimuli and 4 positive and 4 negative nouns as practice stimuli. All words were selected based on the normative studies of Hager and Hasselhorn (1994) and Klauer and Musch (1999). The words were presented at the center of the screen in a rectangular frame (see Figure 1). The carpets were blue and yellow trapezoidal figures presented on both sides of the manikin. Participants could move the manikin to the left by pressing the “B” key on the keyboard and to the right by pressing the “N” key. The keys were marked with labels showing an arrow pointing to the left and to the right, respectively.

Procedure. At the beginning of each trial, a rectangular frame appeared in the center of the screen. At the same time, the manikin appeared either at the left half or at the right half of the screen, and two carpets of the same color appeared, one on the left and one on the right side of the manikin. The color of the carpets and thus the type of the carpets was varied randomly from trial to trial. After 750 ms, a word was presented in the frame. Participants were asked to imagine they were the manikin. In the ultimate-compatible block, they were instructed to move the manikin on that carpet that moved the manikin towards positive words and away from negative words. In the ultimate-incompatible block, they received the reverse instructions. They were told at the start of the study which color indicated which carpet. The assignment of color and carpet was counterbalanced across participants. Participants were asked to respond as quickly and accurately as possible. The time between the onset of the word and participants’ response served as the dependent variable. Immediately after their response, the manikin was shown standing on a carpet and moving with the carpet over the screen. The other carpet disappeared. The movement of the carpet stopped when it reached the frame in the center or the edge of the screen, respectively. The impression of moving was created by showing the carpet with the manikin several times for 50 ms each on different positions. At the end position, they were shown for 100 ms. In total, the moving procedure of the normal carpet took 200 ms, and the moving procedure of the magic carpet took 300 ms. After that, all stimuli were deleted from the screen. The next trial started after 1000 ms. If participants made an incorrect response, the manikin did not move and an error message appeared for 500 ms in the center of the screen. Participants completed one block of ultimate-compatible trials and one block of ultimate-incompatible

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trials, each consisting of 128 trials that were presented in random order. In each block, each stimulus word was presented twice, once on a normal-carpet trial and once on a magic-carpet trial. Each block was preceded by 8 practice trials. The order of the blocks was counterbalanced across participants.

Results

For the analysis of the response latencies, we discarded incorrect responses (9.72%) and responses with latencies that deviated more than 2.5 standard deviations from a participants' individual mean latency in a particular condition (2.65% of the correct responses).[1] We subjected the response latencies to a 2 (ultimate compatibility: compatible vs. incompatible) x 2 (carpet: normal vs. magic) repeated measures analysis of variance (ANOVA).[2] As can be seen in Figure 2, participants responded faster in the ultimate-compatible block than in the ultimate-incompatible block, $F(1, 69) = 70.64$, $p < .001$, $\eta_p^2 = .51$. Also, responses on normal-carpet trials were faster than responses on magic-carpet trials, $F(1, 69) = 83.19$, $p < .001$, $\eta_p^2 = .55$. In addition, the ANOVA yielded a significant interaction between ultimate compatibility and carpet, $F(1, 69) = 6.19$, $p = .015$, $\eta_p^2 = .08$. Simple comparisons indicated that ultimate-compatible responses were faster than ultimate-incompatible responses both on normal-carpet trials, $F(1, 69) = 93.04$, $p < .001$, $\eta_p^2 = .57$, and on magic-carpet trials, $F(1, 69) = 21.43$, $p < .001$, $\eta_p^2 = .24$. Yet, as indicated by the significant interaction the ultimate-compatibility effect was smaller on magic-carpet trials than on normal-carpet trials.

The analysis of the error rates revealed corresponding results (see Table 1). A 2 (ultimate compatibility: compatible vs. incompatible) x 2 (carpet: normal vs. magic) ANOVA yielded a significant main effect of ultimate compatibility, $F(1, 69) = 28.11$, $p < .001$, $\eta_p^2 = .29$, a significant main effect of carpet, $F(1, 69) = 25.51$, $p < .001$, $\eta_p^2 = .27$, and a significant interaction between ultimate compatibility and carpet, $F(1, 69) = 9.86$, $p = .002$, $\eta_p^2 = .13$. Simple comparisons indicated that participants made fewer errors in the ultimate-compatible block than in the ultimate-incompatible block both on normal-carpet trials, $F(1, 69) = 110.29$, $p < .001$, $\eta_p^2 = .62$, and on magic-carpet trials, $F(1, 69) = 15.07$, $p < .001$, $\eta_p^2 = .18$. Yet, as indicated by the significant interaction the ultimate-compatibility effect was smaller on magic-carpet trials than on normal-carpet trials.

Discussion

Experiment 1 shows that stimulus valence facilitates behavior that ultimately causes a compatible DC, even when this requires an immediate DC in the opposite direction. We also observed faster responses on normal- as compared to magic-carpet trials. This indicates that selecting a response whose immediate effects are contrary to its ultimate effects poses a response conflict that takes time to be resolved. The important conclusion

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of our experiment is, however, that valence helps to resolve this conflict in favor of the response that produces ultimate-compatible DC.

Finally, we observed a smaller ultimate-compatibility effect when ultimate DC required an immediate DC in the opposite direction (magic carpets) as compared to when ultimate and immediate DC were matched (normal carpets). This suggests that valence also facilitated immediate-compatible DC, albeit to a smaller extent than ultimate-compatible DC; otherwise, we would have observed a reversed ultimate-compatibility effect with magic carpets. It is important to note that the smaller ultimate-compatibility effect on magic-carpet trials is unlikely to be an artifact of the longer reaction times with magic carpets. First, several authors have argued that slower responses generally go along with larger response latency differences due to statistical reasons (Chapman, Chapman, Curran, & Miller, 1994; Faust, Balota, Spieler, & Ferraro, 1999). Second, several studies have shown that response latency differences become larger with slower responses in SRC-tasks that involve an overlap between the relevant stimulus feature and the relevant response feature (e.g., Hommel, 1996; Proctor & Vu, 2010). A re-analysis of the data from an earlier approach-avoidance SRC-task (Krieglmeyer & Deutsch, 2010, Experiment 1) confirmed that this effect also holds when affective features of the stimuli and responses overlap. Thus, our observation of a smaller ultimate-compatibility effect with magic as compared to normal carpets is not an artifact of differences in response speed but suggests that immediate-compatible responses were facilitated to some degree.

This observation raises the question whether the impact of valence on immediate- and ultimate-compatible responses follows the same time course. In particular, immediate-compatible responses might be triggered more quickly than ultimate-compatible responses because situational constraints do not need to be considered. Consequently, immediate compatibility might dominate when participants respond relatively fast whereas ultimate compatibility might dominate on slow responses. As a result, the observed ultimate-compatibility effect on magic-carpet trials might be confined to slow responses whereas a reversed ultimate-compatibility effect might be found on fast responses. This pattern should not be evident on normal-carpet trials because here immediate- and ultimate-compatibility act in concert. To evaluate this possibility we conducted a bin analysis (cf. De Jong, Liang, & Lauber, 1994) by dividing individual reaction time distributions for each condition (i.e., the four combinations of carpet and ultimate compatibility) into four 25% bins and computed the mean reaction time for each bin and condition. A 2 (ultimate compatibility: compatible vs. incompatible) x 2 (carpet: normal vs. magic) x 2 (bin: 1 vs. 2 vs. 3 vs. 4) ANOVA revealed a significant interaction between ultimate compatibility and bin, $F(3, 207) = 59.21$, $p < .001$, $\eta_p^2 = .46$, that was not further qualified by a three-way interaction between ultimate compatibility, bin, and carpet, $F < 1$. Thus, the response latency difference

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between ultimate-compatible and ultimate-incompatible trials varied across bins, but did so in the same way with normal as with magic carpets. Most importantly, inspection of the means revealed that ultimate-compatible responses were faster than ultimate-incompatible responses in all conditions. In particular, mean latency differences between ultimate-incompatible and ultimate-compatible normal-carpet trials were 123 ms, 207 ms, 281 ms, and 449 ms in bins 1-4, respectively. On magic-carpet trials, the mean latency differences were 19 ms, 88 ms, 181 ms, and 387 ms in bins 1-4, respectively. Thus, even when participants responded relatively fast, the immediate-compatibility effect was not stronger than the ultimate-compatibility effect. Note, however, that the fastest 25% of responses on magic-carpet trials (M = 775 ms) were slower than the fastest 25% of responses on normal-carpet trials (M = 672 ms). Thus, we cannot rule out the possibility that the behavioral representation of immediate-compatible DC is activated earlier than the representation of ultimate-compatible DC.

Experiment 2

The aim of Experiment 2 was to replicate and extend the results of Experiment 1. Particularly, Experiment 2 focused on the observation that stimulus valence facilitated immediate-compatible DC in parallel to ultimate-compatible DC. Because response latencies in Experiment 1 were relatively long, Experiment 1 cannot exclude that valence facilitates immediate-compatible responses at early stages of processing, whereas ultimate-compatible responses are facilitated only at later stages of processing. In Experiment 2, we created conditions that aimed at strengthening the influence of stimulus valence on ultimate DC while at the same time increasing response speed. To this end, we drew on an idea developed by Lewin (1935), who suggested that changing the perception of the situation helps making a detour. More specifically, Lewin argued that making a detour is difficult because valenced objects exert pulling and pushing forces. If, however, the single steps of the detour are represented as a unified action, making the detour becomes easier because the first step is no longer perceived as being incompatible with the overall direction. As a consequence, the impact of valence on immediate DC should be eliminated. We hypothesized that it might be easier to represent the behavior as a unitary whole if perceptual cues promote such a representation. Such perceptual cues are often present in natural settings. For instance, in the example provided in the introduction the window and the door of the bakery serve as such perceptual cues. Following this reasoning, we manipulated ultimate DC in a different way than in Experiment 1. In particular, participants saw two pathways on the screen, a straight and a winding pathway, which led from the edges of the screen to the center (see Figure 1). The manikin always appeared in the middle of one of the two pathways. Immediate and ultimate DC matched when the manikin appeared on the straight pathway but mismatched when it appeared on the winding pathway. We assumed that the layout of the pathway

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would facilitate representing the behavior as a unitary whole and, therefore, the impact of valence on immediate DC should be eliminated. Thus, we expected stimulus valence to facilitate ultimate-compatible responses on straight and winding pathways to an equal extent. Furthermore, we assumed that determining the correct response would be easier in this setting as compared to Experiment 1, where the rules associating the color of the carpets with their functionality had to be retrieved from short-term memory. As a consequence, responses should be faster than in Experiment 1.

Method

Participants. Fifty-seven students (48 women and 9 men) at the University of California Davis participated for partial course credit. Their mean age was 19.7 years (*SD* = 2.7 years). Two participants were excluded because their error rate deviated more than 2.5 standard deviations from the mean error rate.

Materials. Stimuli were 16 positive and 16 negative nouns selected from Bargh, Chaiken, Govender, and Pratto (1992). The words were presented at the center of the screen in a rectangular frame. Two pathways, one straight and one winding, led from the top and bottom of the screen to the centered frame (see Figure 1). We generated four versions (by flipping the picture of the pathways vertically and horizontally) that differed with respect to which pathway appeared at the bottom or top, and whether the exit of the winding pathway was on the left or right side. A manikin was presented in the middle of one pathway. Participants could move the manikin upward and downward by pressing the up and down arrow keys, respectively.

Procedure. A trial started with the presentation of the pathways, the rectangular frame in the center, and the manikin. It was determined randomly from trial to trial, which version of the pathways was shown and where the manikin appeared. All possible combinations were presented equally often. After 750 ms, a word was presented in the frame. In the ultimate-compatible block, participants were instructed to move the manikin toward the positive and away from the negative word as quickly as possible while making as few errors as possible. In the ultimate-incompatible block, the response mapping was reversed. When participants pressed the respective key once, the manikin automatically moved to the end position (i.e., the centered frame or the edge of the screen). The impression of moving was created by showing the manikin several times for 50 ms each on different positions. At the end position, it was shown for 100 ms. The moving procedures lasted 150 ms on the straight pathway and 250 ms on the winding pathway. The next trial started after 1000 ms. An incorrect response prompted an error message. Participants completed one block of ultimate-compatible trials and one block of ultimate-incompatible trials, each consisting of 128 trials that were presented in random order. Each block was preceded by 16 practice trials. The order of blocks was counterbalanced across participants.

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Results

For the analysis of the response latencies, we discarded incorrect responses (4.50%) and responses with latencies that deviated more than 2.5 standard deviations from a participants' individual mean latency in a particular condition (2.83% of the correct responses). A 2 (ultimate compatibility: compatible vs. incompatible) x 2 (pathway: straight vs. winding) ANOVA revealed that ultimate-compatible responses were faster than ultimate-incompatible responses, $F(1, 54) = 7.47$, $p = .008$, $\eta_p^2 = .12$ (see Figure 2). Also, responses were faster when the manikin appeared on a straight as compared to a winding pathway, $F(1, 54) = 116.47$, $p < .001$, $\eta_p^2 = .68$. The interaction between ultimate compatibility and pathway was not significant, $F < 1$. Simple comparisons confirmed that stimulus valence facilitated ultimate-compatible responses on straight, $F(1, 54) = 12.27$, $p = .001$, $\eta_p^2 = .19$, as well as on winding pathways, $F(1, 54) = 4.58$, $p = .037$, $\eta_p^2 = .08$.

A 2 (ultimate compatibility: compatible vs. incompatible) x 2 (pathway: straight vs. winding) ANOVA on error rates yielded a main effect of pathway, $F(1, 54) = 40.0$, $p < .001$, $\eta_p^2 = .43$ (see Table 1). No other effect was significant, all Fs < 1.3.

Discussion

Replicating the results from Experiment 1, responses were faster when they caused an ultimate-compatible DC as compared to when they caused an ultimate-incompatible DC, regardless of the direction of immediate DC. Specifically, stimulus valence facilitated ultimate-compatible responses on the straight and winding pathways to an equal extent. This suggests that valence facilitated only ultimate-compatible DC, but not immediate-compatible DC. At the same time, participants responded considerably faster than in Experiment 1 (818 ms vs. 1167 ms), suggesting that ultimate-compatible DC can be facilitated even at relatively early stages of processing. We did not find an effect of valence on error rates. Because approach-avoidance SRC-tasks typically do not involve a response time window effects are more likely found on response latencies than on error rates. Together, the results from Experiment 2 further bolster our conclusion that stimulus valence automatically facilitates ultimate-compatible DC in the sense of relatively fast, unintentional, and uncontrolled.

General Discussion

In two experiments, stimulus valence facilitated responses that ultimately caused a compatible DC, regardless of the direction of immediate DC. Most importantly and going beyond previous research, the present experiments show that stimulus valence facilitates even immediate-incompatible DC if it ultimately leads to a compatible DC. Whereas stimulus valence also facilitated immediate-compatible responses to some degree in Experiment 1, no such evidence was found in Experiment 2. Following Lewin (1935), we hypothesized that the

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automatic impact of valence on immediate responses would be eliminated if perceptual cues such as the layout of the pathway promote representing the behavioral sequence as a unitary whole. Supporting this reasoning, valence facilitated ultimate-compatible responses to the same extent on the straight pathway (immediate = ultimate DC) as on the winding pathway (immediate ≠ ultimate DC). This suggests that stimulus valence facilitated only ultimate-compatible DC, but not immediate-compatible DC.

By employing an SRC-task we demonstrated that the impact of valence on ultimate-compatible DC is automatic in the sense of unintentional (i.e., in the absence of the goal to let valence influence the responses) and relatively fast. Experiment 1 provided no definite evidence that the link between valence and ultimate DC can be so fast that it even occurs at early stages of processing and eliminates any tendencies potentially resulting from effects of valence on immediate DC. Experiment 2, however, corroborated the notion of a fast link between valence and ultimate DC by showing that stimulus valence facilitated only ultimate-compatible (but not immediate-compatible) DC, although participants responded substantially faster than in Experiment 1. Finally, our studies also indicate that the impact of valence on ultimate DC may be automatic in the sense of uncontrolled, that is, in the presence of the goal to prevent the impact of valence on approach-avoidance responses.

How do our findings relate to the theories discussed in the introduction? First, they suggest that consequences that are only a few seconds away from one's actions can be incorporated in automatic response tendencies. This is an important insight for theories of self-control, which suggest that responding on the basis of long-term consequences requires non-automatic processes to counteract immediate impulses (e.g., Metcalfe & Mischel, 1999; Strack & Deutsch, 2004). Thus, the conflict metaphor in these models may primarily apply to situations where the long-term consequences are very removed (hours, days). Second, our findings are consistent with Lewin's (1935) idea that valenced objects exert immediate pulling and pushing forces unless the behavior is represented as a unitary whole. However, our findings go beyond Lewin's theorizing in showing that valenced objects automatically facilitate even ultimate-compatible DC. Third, the present results are in line with definitions of approach-avoidance motivation in terms of ultimate DC that can be achieved by various specific behaviors (cf. Lang et al., 1990). Going beyond existing theories of approach-avoidance motivation, they shed light on the automaticity of the link between valence and ultimate DC. Finally, the evaluative coding account (Eder & Rothermund, 2008) may explain the present findings given that participants labeled their behavior only in terms of ultimate DC. However, this account is not as obvious for our studies than for previous studies. In previous studies, the labeling of the responses remained the same throughout the task whereas in our studies it varied from trial to trial because it depended on the position of the manikin and whether immediate and ultimate

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DC were (mis)matched. To date, no evidence has shown that responses with multiple context-dependent meanings are coded in an evaluative way. Furthermore, from the perspective of the evaluative coding account one may have expected participants to simplify the task by re-labeling the responses in terms of immediate DC in the incompatible block when immediate and ultimate DC were (mis)matched, resulting in a reversed compatibility effect on these trials.

In sum, two experiments demonstrated that stimulus valence automatically facilitates behavior that ultimately causes a desired DC, regardless of the direction of immediate DC. Thus, behavioral tendencies of approach-avoidance are relatively farsighted. From an evolutionary point of view, such a mechanism can be considered as highly adaptive.

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Footnotes

[1] To validate the results, we conducted additional analyses, where we discarded responses with latencies below 150 ms and above 2500 ms. These analyses revealed corresponding results in both experiments.

[2] We conducted preliminary ANOVAs that included the factors order of blocks (Experiment 1 and 2) and assignment of carpet and color (Experiment 1 only). The results from these analyses did not change the conclusions drawn from the main analyses.

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Table 1

Error Rates as a Function of Ultimate Compatibility and Carpet/Pathway in Studies 1 and 2.

	Normal Carpet / Straight Pathway		Magic Carpet / Winding Pathway	
	Ultimate Compatible	Ultimate Incompatible	Ultimate Compatible	Ultimate Incompatible
Study 1	5.0 (4.7)	11.4 (8.5)	9.6 (6.3)	12.9 (10.0)
Study 2	2.6 (4.3)	3.8 (4.7)	5.7 (6.5)	5.9 (5.2)

Note. Standard deviations are printed in parentheses.

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Figure Captions

Figure 1. Illustration of the stimuli in Experiment 1 (left) and Experiment 2 (right). A positive or negative word was presented in a frame in the center of the screen. In Experiment 1, a manikin was shown between two flying carpets at the left or right half of the screen. In Experiment 2, a manikin was shown on a straight or winding pathway at the upper or lower half of the screen.

Figure 2. Response latencies from Experiment 1 (left) and Experiment 2 (right) as a function of ultimate compatibility (compatible vs. incompatible) and carpet (normal vs. magic) or pathway (straight vs. winding), respectively. Error bars represent the standard error of the mean.

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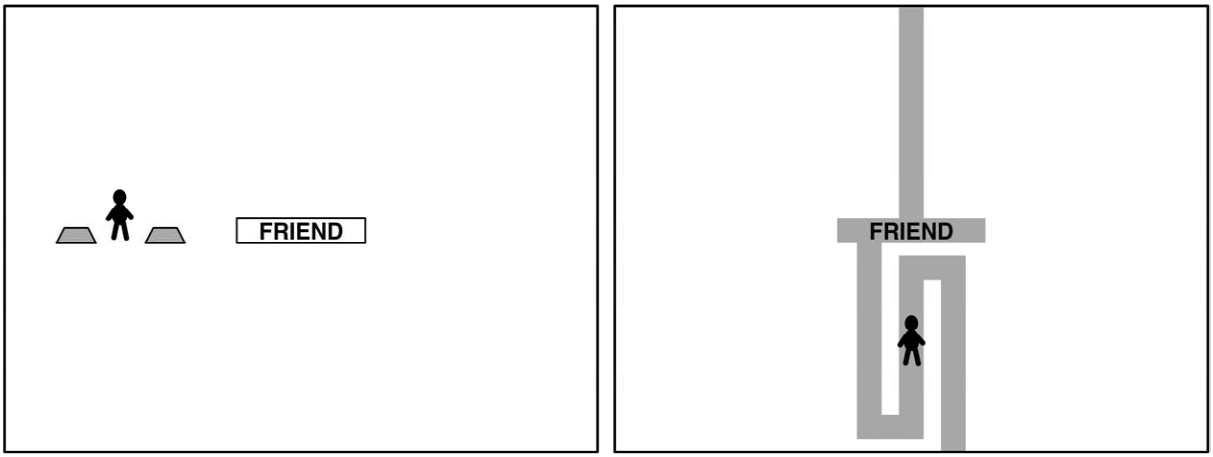

Fig. 1

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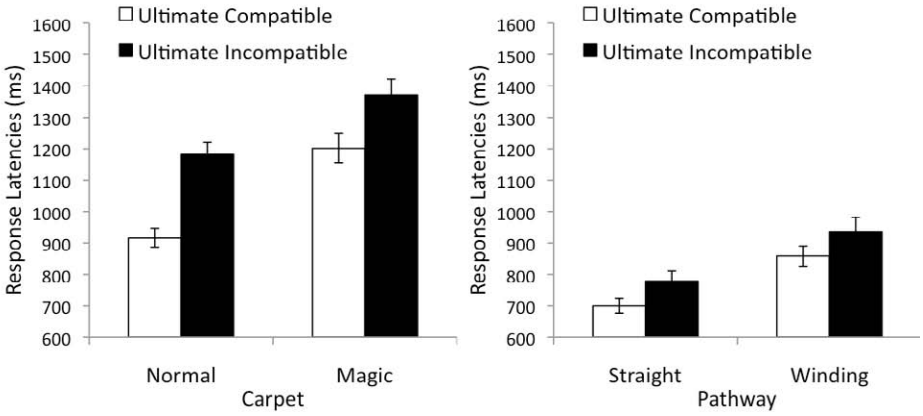

Fig. 2

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