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If I imagine it, then it happened: The Implicit Truth Value of imaginary representations

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ABSTRACT

Imagination sometimes leads people to behave, feel, and think as though imagined events were real even when they know they were not. In this paper, we suggest that some understanding of these phenomena can be achieved by differentiating between Implicit Truth Value (ITV), a spontaneous truth evaluation, and Explicit Truth Value (ETV), a self-reported truth judgment. In three experiments, we measure ITV using the autobiographical Implicit Association Test (Sartori, Agosta, Zogmaister, Ferrara, & Castiello, 2008), which has been used to assess which of two autobiographical events is true. Our findings demonstrate that imagining an event, like experiencing an event, increases its ITV, even when people explicitly acknowledge the imagined event as false (Experiments 1a and 1b). Furthermore, we show that imagined representations generated from a first-person perspective have higher ITV than imagined representations generated from a third-person perspective (Experiment 2). Our findings suggest that implicit and explicit measures of truth differ in their sensitivity to properties underlying truth judgment. We discuss the contribution of characterizing events according to both ITV and ETV to the understanding of various psychological phenomena, such as lying and self-deception.

1. Introduction

Picasso said, "Everything you can imagine is real." Research shows that imagining an event (e.g., getting lost in a mall as a child) increases the likelihood of mistakenly believing the event to be true. Specifically, when uncertainty exists regarding the truth value of an event, non-content cues of the events' representation (e.g., vividness, fluency, perspective) influence judgments of truth. Can non-content cues influence truth evaluation even when an event is known to be false?

In the current research, we differentiate between Implicit Truth Value (ITV), a spontaneous truth evaluation, and Explicit Truth Value (ETV), a self-reported truth judgment. We propose that whereas ETV is more dominantly influenced by a reasoning process in which one considers the given information in light of other knowledge s/he has, the ITV is more sensitive to those characteristics of an event's representation that elicit a sense of truth (see below). Therefore, we suggest that even events that are judged explicitly as false may vary in their ITV. As one possible demonstration, we hypothesize that imagination can enhance the ITV of an event even when one explicitly acknowledges the event is unreal.

Our hypothesis is motivated by phenomena in which people react to information although they know it to be false (e.g., Anderson, 1983; Carroll, 1978; see also Radford, 1977, for the *paradox of fiction*). Research shows that imagination may lead people to *behave* as if the imagined information were true even though they clearly *know* it is false (e.g., Holmes & Mathews, 2005; Morewedge, Huh,

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& Vosgerau, 2010; Peck & Shu, 2009). For example, imagining a negative emotional event is sufficient to generate a negative emotional response (Holmes & Mathews, 2005), and imagined consumption of food leads to a decrease in its subsequent intake through habituation (Morewedge et al., 2010). Such evidence demonstrates the importance of identifying the factors that generate a truth-like response and identifying measures that are more sensitive to these factors.

1.1. Processes underlying truth judgment

The hallmark of explicit truth is verifiability. One makes a judgment regarding whether information is true or false by analyzing the proposition(s) in question to determine whether its content fits with other knowledge one has. Although studies disagree about the exact nature of the psychological processes that underlie such a determination of fit (e.g., Evans, 2007; Byrne & Johnson-Laird, 2009), the different models assume truth is computed through controlled processes (Gawronski & Bodenhausen, 2006). Nevertheless, research shows that automatic, non-analytic processes might also play a role in explicit judgments of truth. The research described below demonstrates that when people have little prior knowledge about a statement and therefore cannot reason about its truth value, factors that are unrelated to the informational content of a representation, such as fluency and vividness, can influence whether the entity in question is viewed explicitly as true (Begg, Anas, & Farinacci, 1992). To illustrate, people are more likely to believe a trivia sentence is true if they have seen the sentence before or if it is presented in a higher contrast (e.g., Hansen, Dechêne, & Wänke, 2008; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Koehler (1991) reviewed studies showing that imagination influences judgments of likelihood, and Hansen and Wänke (2010) documented that concrete language increases perceptions of the truth of ambiguous trivia sentences, an effect attributed to the greater perceived vividness of concrete (compared to abstract) sentences.

Illusions of truth are not limited to statements about external entities. The research of Loftus and colleagues (e.g., Bernstein & Loftus, 2009; Loftus, 2003) suggests people might be misled into believing a false event actually happened to them, by manipulating the way the information is represented in their mind. For example, participants were more confident they had experienced a childhood event (e.g., breaking a window with their hands) after imagining the scenario during a previous session (Manning, Loftus, & Sherman, 1996), and the more times participants imagined an action, the more likely they were to believe they had performed it (Thomas, Bulevich, & Loftus, 2003). More generally, this research shows that in the absence of strong cues for veracity, people are more likely to judge rich and vivid representations as true (see also Lyle & Johnson, 2006).

Johnson and colleagues (1981, 2006) discuss in detail the interplay between the content of memory and its structural characteristics. The authors proposed the source-monitoring framework (Johnson, Hashtroudi, & Lindsay, 1993) to explain the dynamics of systematic and heuristic processes in peoples' assessments of whether a memory representation is true (real) or false (fiction). In this framework, people can, on the one hand, base the true/false decision on systematic processes involving logic and reason (e.g., the plausibility of the event). On the other hand, they can base their judgments on the vividness of the representation when reasoning processes do not allow them to determine whether the memory is true or false.

The above-mentioned research implies that non-content cues (e.g., fluency, richness of representation, or quality of imagination) influence judgments of truth when individuals are uncertain about the entity's veracity. In the current research, we suggest that implicit measures of truth may capture the influence of the non-content cues even when people are certain an event in question is untrue.

1.2. Measures of truth

Truth is typically assessed using a direct true/false categorization judgment, possibly with an addition of a confidence component (e.g., Gross, Holz, & Miller, 1995). The dominance of the direct measures in truth judgments reflects the common view of the validation processes, namely, that the processes of evaluating the truth are propositional, requiring deliberation and cognitive resources (e.g., Gawronski & Bodenhausen, 2006). This conceptualization of truth fits with ETV.

However, in some cases, people want to conceal what is true. Research highlights the usefulness of indirect measures of truth for revealing hidden information without relying on self-reports. For example, lie-detection tools use physiological measures such as skin conductance response or reaction time methodologies for identifying concealed information (for reviews, see Ben-Shakhar, 2012; Meijer, Selle, Elber, & Ben-Shakhar, 2014).

Sartori, Agosta, Zogmaister, Ferrara, & Castiello, 2008 developed the autobiographical Implicit Association Test (aIAT; see Agosta & Sartori, 2013 for review) as a tool to detect which of two contradictory events is true for a given individual. The aIAT is based on the traditional Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998). Results from different studies using various autobiographical memories showed that when response to sentences related to a true autobiographical event shared the response key with other true sentences, reaction time was faster than when response to sentences related to a true autobiographical event and to false sentences shared the same key. Recently, Ten Brinke, Stimson, and Carney (2014) used the same logic to demonstrate the superiority of the IAT-type measure over a direct judgment of deceptiveness in detecting deception in observed scenarios. In the current research, we used the aIAT as a measure of ITV. We hypothesized that not only is the aIAT an indirect way to examine real autobiographical events, but it is also sensitive to the way the event is represented in the mind. Therefore, we expected that imagination, just like real experience, would enhance ITV.

1.3. The present research

The present research examines the influence of imagination on ITV. In particular, we hypothesize that imagination gives rise to ITV, regardless of whether the imagined content is real or fictional, and whether one knows it is true or false. To capture these distinctions, we asked participants in our experiments to imagine performing an action without actually doing it. We measured ITV using the aIAT task.

We hypothesize that ITV is sensitive to the representation's characteristics, and we test this hypothesis by investigating whether imagined events are implicitly truer than non-imagined events regardless of whether one declares the event is true or false, and examining the influence of the characteristics of imagination on ITV.

Experiments 1a and 1b examine whether imagining an event someone has not experienced makes it implicitly true relative to a non-imagined counterpart even when the participant classifies the imagined event as false. Experiment 2 varies the nature of the mental representation of the imagined event by asking participants to imagine an event from a first-person perspective or a third-person perspective. This manipulation relies on the finding that imagination is more experiential in the first-person perspective (Libby & Eibach, 2011). We hypothesized, therefore, that a first-person perspective would lead to a higher ITV of the imagined event than a third-person perspective, without affecting the truth perception when assessed by the direct measure. Using perspective manipulation allows us to examine the unique contribution of the characteristic of the imagined representation on ITV while controlling for the content and participants' explicit beliefs.

2. General procedure

All experiments began with general instructions informing participants that the experiment would consist of several different tasks and that they would receive instructions for each task via the computer monitor. The first task was the event-induction task (described below) in which participants imagined picking one of two playing cards. Then we assessed the ITV of the imagined event, using a variant of the aIAT paradigm.

2.1. Guided imagination

Participants underwent a guided-imagination procedure in which they were presented with sentences that described the action of selecting and viewing one of two cards (see Table 1 for the list of sentences). We instructed participants to read each sentence and generate a vivid image of its content. The imagination-induction task required approximately one minute to complete.

2.2. Assessment of Implicit Truth Value (ITV)

We measured ITV using an adaptation of the aIAT task (Sartori et al., 2008). Participants classified two types of sentences. One type involved situations that were necessarily true or false at the time of the experiment for all participants (e.g., "I am in front of a computer," "I am at the beach"). Each of these sentences was categorized as either "true" or "false." Other sentences described events involving the selection of a playing card (e.g., "I picked card number 7," "I picked card number 4"). These were to be classified according to the card, namely, as either "4 of diamonds" or "7 of spades." The 20 sentences used appear in Table 2. Note that the participants did not have to categorize the "card" sentences as true or false. Nevertheless, we hypothesize that having the event represented in the mind makes classifying the sentences about the imagined event with true sentences easier than classifying the imagined event with false sentences. To investigate this hypothesis, we examined whether the compatibility between the classification of the card sentences (4 or 7) and that of the

Table 1
The sentences used in the guided-imagination task in the "4 of diamonds" condition.

*Imagine that there are two cards lying face down in front of you
*You pick up one of the cards
*And see the 4 of diamonds
You look at the red diamonds
Two are placed one beside the other on the upper half of the card
And two are on the lower half of the card
You see the four of diamonds clearly
You look at the upper left-hand side of the card
And see the digit 4
Under the digit you see another small diamond
You take a close look at the card
And look at the four of diamonds again
*You put the card back in its place

Notes: Participants were shown one sentence at a time for 4 s. Participants in Experiment 3 were shown only sentences marked by *. (The sentences are translated from Hebrew.)

Table 2
Sentences used in the aIAT task.

Category	Sentences
True for everyone	I am in the basement of the psychology department
	I am in a little room with a computer
	I am doing a psychology experiment
	I am in the psychology laboratory
	I am in front of the computer
False for everyone	I am climbing a mountain
	I am at the beach
	I am eating in a restaurant downtown
	I am playing football
	I am in a shop
4 of diamonds	I picked card number 4
	I turned over card "four.'
	I saw the 4 of diamonds
	I turned over the 4 of diamonds
	I have the 4 of diamonds
7 of spades	I picked card number 7
	I turned over card "seven"
	I saw the 7 of spades
	I turned over the 7 of spades
	I have the 7 of spades

Note: The sentences are translated from Hebrew.

other sentences (true or false) affected the speed of classification.

Respondents were required to complete five blocks of speeded categorization trials: three practice blocks, and two critical blocks serving as the basis for calculating ITV. During the practice blocks, participants categorized sentences belonging to the categories of true and false or "4 of diamonds" or "7 of spades" using one of two keys, one positioned on the left of the keyboard ("A") and one on the right ("L"). Sentences were presented in the center of the monitor, and two labels showing the categories used for classification appeared at the top-left and top-right corners of the screen. In the two critical blocks, the participants performed double categorization by interchangeably classifying each of the 20 sentences that appear in Table 2. To help them differentiate between the two types of sentences and categories, the true/false sentences and their category labels appeared in a white font and the card sentences and their labels appeared in a green font, in all five blocks. Next, we describe the five blocks in detail (see Fig. 1).

In Block 1 (20 trials), participants categorized only the true and false sentences. We instructed the participants to press the right key to classify true sentences and the left key to classify false sentences. Each of the sentences was presented twice, and the order of appearance was randomized differently for each participant.

In Block 2 (20 trials), participants classified the card sentences by pressing the right key to classify "4 of diamonds" sentences and the left key to classify "7 of spades" sentences. Again, each sentence was classified twice, and they appeared in a different random order for each participant.

Block 3 was one of the two critical blocks in which all 20 sentences were to be classified. Participants used the right key to classify both "true" and "4 of diamonds" sentences and the left key to classify both "false" and "7 of spades" sentences. This block contained 60 trials, meaning each sentence was classified three times.

Block 4 (20 trials) was similar to Block 2, except the response keys were switched: participants used the right key to classify "7 of spades" sentences and the left key to classify "4 of diamonds" sentences. Each of the 10 card sentences was classified twice in this block.

Block 5 was similar to Block 3 and involved double categorization of all 20 sentences. Participants used the right key to classify both "true" and "7 of spades" sentences and the left key to classify both "false" and "4 of diamonds" sentences. This block contained 60 trials, meaning each sentence was classified three times.

For half of the participants, we administered the blocks in the order outlined above, whereas for the other half, the order of Blocks 3 and 5 and Blocks 2 and 4 were reversed. For the order presented herein, Block 3 was the critical

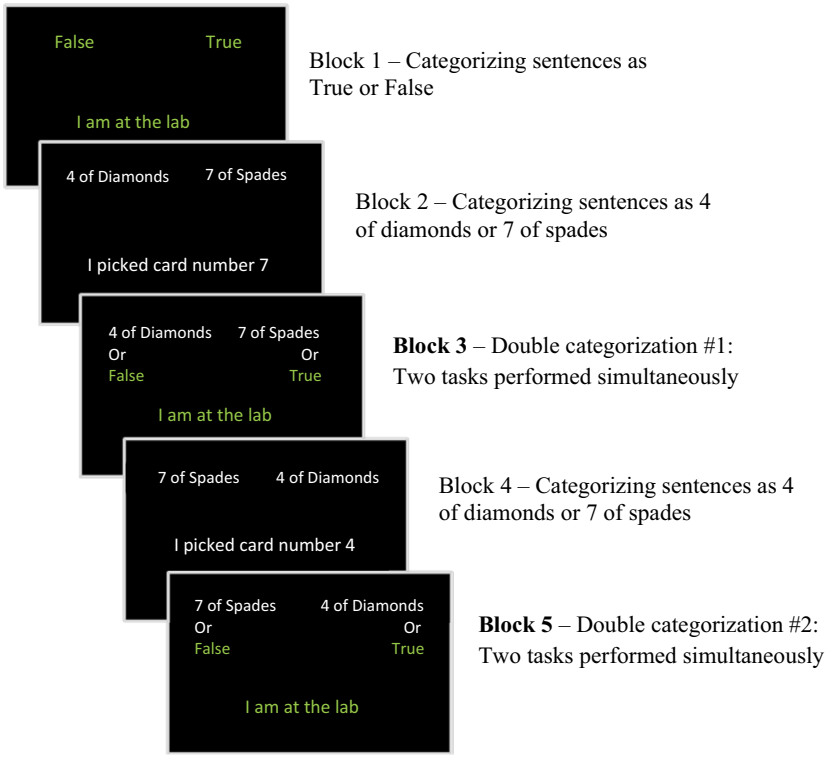

Fig. 1. The *aIAT Paradigm. Notes:* The Autobiographical IAT (Sartori et al., 2008) consists of 5 blocks. Blocks 1, 2, and 4 are training blocks. Blocks 3 and 5 are the critical blocks. The pairing of true/false and 4/7 is counterbalanced among participants. In the present example, Block 3 is compatible and Block 5 is incompatible for participants who picked/imagined picking the 7 of spades, whereas Block 3 is incompatible and Block 5 is compatible for participants who picked/imagined picking the 4 of diamonds. ITV is indicated by the standardized mean difference in RT between the incompatible and compatible blocks.

compatible block for those who picked or imagined picking the 7 of spades and the critical *incompatible* block for the group of participants who picked or imagined picking the 4 of diamonds. Block 5 was opposite in compatibility to Block 3. Specifically, Block 5 was the *compatible* block for the participants who performed an incompatible Block 3 and the *incompatible* block for those who performed a *compatible* Block 3.

2.3. Measuring Implicit Truth Value (ITV)

ITV is indicated by the D score, computed as the standardized difference in response latency between the two double-categorization blocks (Greenwald, Nosek, & Banaji, 2003). A positive D score reflects faster responses in the compatible block (which pairs the sentences about the imagined event with true sentences) than in the incompatible block (which pairs the sentences about the imagined event with the false sentences).[1]

2.4. Preliminary study

We carried out a preliminary study, which is described in detail in the Supplementary material, to replicate the effect of real experience on the aIAT and to examine whether merely imagining an event (i.e., without experiencing it) also enhances the implicit truth. Sartori et al. (2008) showed that when participants used one key to categorize the true statements and the sentences describing a real experience and another key to categorize the false statements and the sentences describing an alternative experience, they were faster than when they responded with the opposite pairing. The preliminary study investigates whether imagined events give rise to the same type of facilitation. Participants were randomly assigned to either the real-event or imagined-event condition. Those in the real-event condition actually picked a playing card that was either the 4 of diamonds or the 7 of spades. Those in the imagined-event condition underwent a guided-imagination procedure as described above. Then we assessed the ITV of the target event, using the aIAT paradigm as described above under General Procedure. We found that when responses to either real or imagined events were made with the same key as the true statements, participants were faster compared to the pairing with the false statements. Put differently, like the real event, the imagined event was implicitly truer than the event that was not experienced or imagined.

3. Experiments 1a and 1b

The preliminary study suggests that imagining an event is sufficient to enhance its ITV. Experiment 1 is designed to replicate this finding and explore potential explanations for it. Imagination might enhance ITV in two different ways. It might be that the characteristics of the representation of the imagined event are similar to a representation of a real event and therefore are associated with implicit truth. However, it is possible that participants in our experimental settings regarded the imagined event as a real experience. That is, participants might have believed that in the context of the experimental settings, the imagined event should be regarded as true. Such interpretation might have enabled participants to more easily respond when the imagined event was paired with truth, regardless of the representation's characteristics. In Experiments 1a and 1b, we addressed this possibility by measuring ETV (by asking participants to categorize the imagined event as true or false) in addition to ITV (with the aIAT procedure). We hypothesized that in line with the findings in the preliminary study, imagination would influence ITV. Imagination could also influence the judgment of truth (ETV). Yet we hypothesize that imagined events would be implicitly truer than non-imagined events (as indicated by the aIAT measure) even for those participants who classify the imagined event as false when directly asked about its truth value.

3.1. Method

3.1.1. Participants

Thirty-eight (Experiment 1a) and 47 (Experiment 1b) students participated in the experiments in exchange for 15 NIS (~$ 4) or class credit. We eliminated from the analysis the data of two participants due to technical failure during the ETV measurement procedure.

3.1.2. Design and procedure

All participants in Experiments 1a and 1b underwent a guided-imagination procedure as described above. After the guided-imagination manipulation, all participants were presented with two geometrical shapes (a circle and a square) and instructed to color one of them (the circle). We designed this procedure to highlight the difference between performing an action (the coloring task) and imagining an action (imagining picking a card). Then we assessed ETV by asking participants to make a series of direct true/false judgments (see below), and then measured the ITV of the imagined event, using the aIAT paradigm as described above under General Procedure. Finally, following the ITV measurement, we assessed the vividness of the imagined event (see below).

3.1.3. Measuring ETV

The participants were shown sentences belonging to six categories. Four of these categories appear in Table 2 and included the 20 sentences used in the aIAT. Ten additional sentences referred to the coloring task participants performed after the imagination task. Five sentences described the action of coloring a circle red (e.g., "I colored a circle," an action all participants performed) and five sentences referred to coloring a square blue (e.g., "I colored a square," an action none of the participants performed). Sentences appeared in the center of the monitor, and the labels "true" and "false" were presented in the top-right and top-left corners of the screen, respectively. Participants were asked

[1] We also computed an equivalent statistical analysis in which the compatibility of the response (compatible vs. incompatible) is treated as a repeated-measure factor, and used a mixed-model ANOVA for testing the effect of compatibility on the latency of response. The pattern of findings corresponded to that of the D score. These analyses are reported in the Supplementary material.

to categorize sentences that described an event or a situation that actually took place as "true" and to categorize all other sentences as "false." In Experiment 1a, whenever a participant misclassified a sentence referring to the imagined event (e.g., picking the 4 of diamonds) or the false event (coloring a square) as true, a message on the monitor informed him/her that s/he had made a mistake. Experiment 1b did not include such feedback. Instead, participants were also instructed that "of course, sentences describing the imagined event should be categorized as false."

3.1.4. Vividness of imagination

The participants rated their imagining of picking the card, using six 9-point scales anchored by *faint–vivid, fuzzy–clear, dim–bright, vague–sharp, dull–lively,* and *simple–detailed* (Crisp, Husnu, Meleady, Stathi, & Turner, 2010). We averaged the *ratings* for each participant ($\alpha = .85$ in experiment 1a; .91 in experiment 1b). In addition, we asked the participants to sketch the card they had imagined. Two judges ($r = .79$ in Experiment 1a; .89 in Experiment 1b) who were blind to the experiment's goal scored the similarity of the drawing to the actual card on a 5-point scale. The reproduction score indicates the extent to which the imagined percept is similar to the real event (e.g., Reinitz, Lammers, & Cochran, 1992).[2]

3.2. Results

3.2.1. Explicit Truth Value

In experiment 1a, 53% of the participants classified as false all five sentences describing the imagined event, 28% classified one of the five sentences as true, and the remainder classified two or three sentences as true. Importantly, the misclassification of the imagined-event sentences as true appeared only for sentences that were presented early in the (random) order of presentation. That is, by the end of this task, all participants classified correctly the imagined event as false. In Experiment 1b, 62% of the participants classified as false all five sentences describing the imagined event, 19% classified one sentence as true, and 19% classified two or more sentences as true. We report the analysis of the ITV indicator (the D score) for the entire sample. Yet, to be conservative, we categorized participants into those who classified one or more of the sentences about the imagined event as true, and those who classified all of the sentences as false, and we also report the ITV effect for the latter group only.

3.2.2. Implicit Truth Value

We calculated the D score for each participant. Fig. 2 displays the mean D score and RTs of the compatible and incompatible blocks. We performed on the D score a three-way between-participants ANOVA using the Experiment (1a vs. 1b), Target Card ("4 of diamonds" vs. "7 of spades"), and participants' acknowledgement of the falsity of the imagined event (all false vs. not all false) as factors. The ANOVA revealed D was significantly positive, ($M = .25$, $F(1,75) = 35.68$, $p < .001$, $\eta = .32$), indicating that overall, it was easier for the participants to respond when the sentences about the imagined event shared the response key with true sentences than with false sentences. A positive D score was observed among 72% of the participants. Neither the main effect nor the interactions involving the experiment factor were statistically significant, suggesting the two experiments were associated with a similar pattern of results.[3]

Importantly, the main effect and the interactions involving participants' direct measure of truth did not reach statistical significance, $Fs < 1$, suggesting participants' true/false categorization did not moderate the effect of imagination on ITV. Of particular theoretical interest are those participants (the majority) who rated all the sentences associated with the imagined event as false. Simple-effect analysis revealed that D was significantly positive for this subgroup ($M = .21$, $t(47) = 3.64$, $p < .001$, Cohen's $d = .52$), suggesting that pairing the imagined event with true sentences was easier than with false sentences, even when participants rated the imagined event as false.

The findings also reveal a significant main effect for card ($F(1,75) = 4.35$, $p < .05$, $\eta^2 = .055$), indicating that imagining the 4 of diamonds led to a higher ITV than imagining the 7 of spades ($M = .33$ vs. $M = .17$, respectively). Importantly, simple-effect analyses demonstrated the D score was significantly positive even for the 7-of-spades target card ($p < .01$).

3.3. Discussion

Experiments 1a and 1b demonstrate that an imagination manipulation can influence both ETV and ITV. We found that in spite of our attempts to clarify that the imagined event was false, a sizable minority of participants classified it as true. Importantly, however, imagination influenced ITV even for participants who classified the imagined event as false. This finding is consistent with our suggestion that qualities of imagination that self-report judgments of truth do not capture may affect ITV. We designed Experiment 2 to provide a direct test of this suggestion. However, before introducing Experiment 2, let us discuss two mechanisms that can account for the differences between the truth effects associated with the two measures in Experiments 1a and 1b.

First, we employed two relatively strong procedures in order to clarify to the participants in Experiments 1a and 1b what we meant by truth. In Experiment 1a, participants received feedback informing them about an error whenever they classified a sentence about the imagined event as true, and in Experiment 1b, participants received the direct guideline that imagination means "false." Our manipulations might have been too heavy-handed, in the sense of leading participants to classify the sentences

[2] The vividness score and the reproduction score were very weakly correlated with each other and with the ITV index in Experiments 1a, 1b, and 2. We therefore do not report their analysis in the paper. The full results are available in the Supplementary material.

[3] The effects were similarly strong within each experiment. In Experiment 1a, $F(1,32) = 19.97$, $p < .001$, $\eta^2 = .38$ ($M = .25$); in Experiment 1b, $F(1,43) = 17.47$, $p < .001$, $\eta^2 = .28$ (M = .24).

about the imagined events as false even when they would have liked to classify them as true. To address this possibility, the procedure used to measure explicit truth in Experiment 2 did not include instructions about the correct classification of the imagined event, nor did we provide feedback about errors of classification.

Second, the differences between the two measures of truth might be the product of the response format. That is, in Experiments 1a and 1b, the measure of explicit truth was dichotomous (true vs. false). The binary response format may have reduced the measurement sensitivity (MacCallum, Zhang, Preacher, & Rucker, 2002), creating disparity between the results of ETV and ITV. Accordingly, in Experiment 2, we used a continuous 9-point rating scale for ETV.

Our interpretation of the results of Experiments 1a and 1b attributes the enhanced ITV of the imagined event to the properties of the imagined representation. However, this suggestion is only tentative, because Experiments 1a and 1b do not allow us to test how the guided-imagination protocol led to the ITV effect. Experiment 2 refines the imagination protocol, allowing us to investigate the hypothesis that unlike ETV, ITV is sensitive to differences in imagination qualities.

Libby and Eibach (2011) distinguished between imagination that is based on bottom-up phenomenology (first-person perspective) and imagination that is based on top-down phenomenology (third-person perspective). The former is more influenced by concrete features in the imagined environment and less by the broader context in which the event takes place. First-person perspective gives rise to a more intense subjective experience of the event (Libby & Eibach, 2002; Nigro & Neisser, 1983; Robinson & Swanson, 1993). The distinction between the two perspectives is consistent with research that shows that the perspective of imagination influences the memory of the events (Abelson, 1975) and the emotional and physical sensation one derives from imagination (Robinson & Swanson, 1993). Also, evidence from brain research shows that observing movement from a first-person perspective results in higher activation of motor areas of the brain than observation from a third-person perspective (Ruby & Decety, 2003).

Experiment 2 adopted the perspective manipulation as a way to investigate how the nature of imagination affects ITV. We hypothesized that the event representation generated by imagination from a first-person perspective will result in higher ITV compared to imagination generated from a third-person perspective, as imaginaries generated from a first-person perspective give rise to a greater subjective experience and facilitate reliance on spontaneous activation of the simulated environment (Libby & Eibach, 2002, 2011). We did not expect to find an effect of perspective on ETV, which should be less sensitive to the bottom-up/top-down aspect of imagination.

Experiment 2 employed a third condition of imagination, in which participants imagined the card-selection event as involving another person. This condition served as a control. It used the identical stimuli and instructions, except, of course, that the self was not the target of the imagination protocol. Importantly, although the guided-imagination protocol referred to another person who was picking the card and examining its content, the sentences used in the ETV and the ITV assessment tasks referred to the participant him/herself picking the card. Thus, content-wise, participants should have classified the imagined act as false. This other-person condition, therefore, provides a baseline for the influence of all the factors associated with exposure to the experimental stimuli on the truth measures.

4. Experiment 2

4.1. Method

4.1.1. Participants

One hundred thirty-two students participated in the experiments in exchange for 15 NIS (∼$ 4) or class credit. We eliminated from the analysis four participants due to technical problems during the ITV assessment task, and one participant due to extremely high error rates (more than 20% per critical block in IAT; cf. Greenwald et al., 1998).

4.1.2. Design and procedure

After a general introduction to the experiment, all participants received two geometrical shapes (a circle and a square) and were instructed to color one of them (the circle). Then the participants underwent the imagination-induction task (see below), after which they rated the vividness of their imagination and made direct truth ratings of the event. Finally, we assessed the ITV of the target event, using the aIAT paradigm as described in the General Procedure above.

4.1.3. Imagination task

Participants imagined the action of card selection in one of three conditions. In two conditions participants imagined themselves picking a playing card. In one condition they imagined themselves from a first-person perspective (self-first perspective condition) and in the other condition from a third-person perspective (self-third perspective condition). In a third condition they imagined someone else picking the card (other-person condition).

Participants in the self-first perspective condition were instructed to "read every sentence and imagine it from your own perspective. In other words, try to see in your imagination the situation as you would have seen it if you had experienced and performed the action yourself." Participants in the self-third perspective condition were asked to "read every sentence and imagine it from an external perspective. In other words, try to see in your imagination how you are seen in the situation, as an outside observer would have seen it." Participants in the other-person condition were asked to "read every sentence and imagine it from an external perspective. In other words, try to see the situation like an outside observer looking at another person."

After the perspective was induced, the guided imagination started. Participants in the self-first and the self-third conditions read the following four sentences, presented one at a time, for 5 seconds: (1) imagine that there are

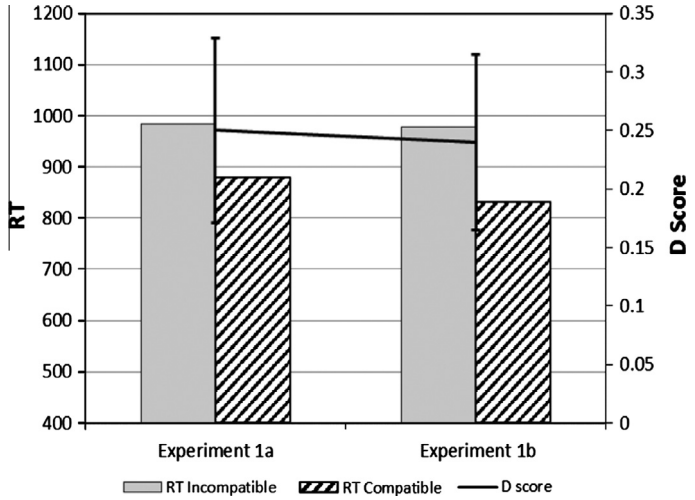

Fig. 2. Means of the D scores and the RT in the compatible and incompatible blocks (Experiment 1).

two cards facing down in front of you; (2) you pick up one of the cards; (3) you see the 4 of diamonds card (alternately, the 7 of spades card); (4) you put the card back in its place. Participants in the other-person condition read sentences that were modified to reflect the action of another person: (1) imagine observing a person sitting in front of two cards facing down; (2) s/he[4] picks up one of the cards; (3) s/he sees the 4 of diamonds card (alternately, the 7 of spades card); (4) s/he puts the card back in its place. Note that the imagination protocol of Experiment 2 is less detailed than the one used in Experiments 1a and 1b in order to allow participants more freedom in generating the image of the scenario in their minds.

4.1.4. Explicit True Value

All participants read the following four sentences, one at a time: "I colored a circle red," "I picked the 4 of diamonds card," "I picked the 7 of spades card," and "I colored a square blue." Participants rated each sentence on a 9-point scale ranging from 1 = *completely false* to 9 = *completely true.*

4.2. Results

4.2.1. The influence of perspective on ETV

The participants rated the imagined and the non-imagined events on a 9-point false/true rating scale. Almost all (98%) participants rated the non-imagined event as "completely false." By contrast, 50% of the participants rated the imagined event as "completely true." Specifically, 30% of the participants in the other-perspective condition categorized the sentence about the imagined card as completely true, compared to 62% of the participants in the self-first condition and 56% of participants in the self-third condition. The utilization of the "completely false" response category was the mirror image. Specifically, 55% of the participants in the other-person condition rated the sentence about the imagined event as completely false, compared to 19% and 26% in the self-first and self-third perspectives, respectively. We were unable to use parametric ANOVA to compare the truth rating in the three conditions, because the *U*-shaped distribution of responses strongly violated the normality assumption required by parametric tests. Therefore, we employed a non-parametric statistical test. A Kruskal–Wallis one-way ANOVA indicated the truth ratings in the three perspective conditions came from different distributions, $\chi^2(2) = 11.43$, $p < .01$. A Mann–Whitney analysis for the pairwise comparisons indicated the two self-perspective conditions differed significantly from the other-person condition, $Z = 3.34$, $p < .01$, but the self-first and self-third perspectives did not differ statistically from each other, $Z = 0.47$, $p = .64$.[5] To sum up: (i) the imagined event was rated similarly in the two self-perspective conditions; and (ii) as expected, truth ratings in the two self-perspective conditions were higher than in the other-person condition.

4.2.2. The influence of perspective on ITV

Fig. 3 displays the D scores and RTs of the compatible and incompatible blocks in the three perspective conditions. We performed a two-way ANOVA with perspective and target card as independent variables on the D scores. As expected, we found a significant perspective effect, $F(1,122) = 4.05$, $p < .020$ $\eta^2 = .062$. In line with our first hypothesis, the planned comparison revealed the D score in the self-first perspective was significantly higher than the D score in the self-third perspective, $t(122) = 2.09$, $p < .042$, Cohen's $d = .18$. Our second hypothesis suggested the ITV of participants in the other-person condition would be lower compared to the two self-perspective conditions.

[4] The gender of the target of imagination was identical to the participant's gender.

[5] A parametric ANOVA revealed a significant main effect for perspective $F(1,122) = 4.93$, $p < .01$, $\eta^2 = .076$. Simple effect analyses indicated that the two self-perspective conditions led to similar ETVs ($M_{1st} = 6.67$ vs $M_{3rd} = 6.30$, $t(122) = .43$, $p = .66$). However, both were different from the other-person condition ($M_{self} = 6.48$ vs $M_{other} = 4.15$, $t(122) = 3.14$, $p < .002$).

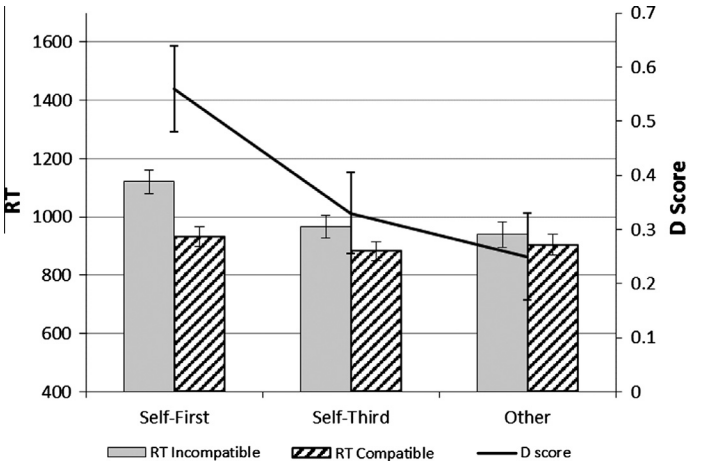

Fig. 3. Means of the D scores and the RT in the compatible and incompatible blocks (Experiment 2).

Indeed, average D score in the two self-perspective conditions was significantly higher than for the other-person condition, $t(122) = 2.03$, $p < .05$, Cohen's $d = .18$. We found no effect for the target card, $F(1,122) = 1.47$, $p = .23$ $\eta^2 = .012$, nor did we observe an interaction between the target card and the perspective, $F(1,122) = .94$, $p = .39$, $\eta^2 = .015$.

Next, we examine, separately in each condition, whether the imagined event was associated with truth more than the counter event was. To do so, we compared the magnitude of the ITV indicator in each of the perspective conditions to zero. As expected, the D score was significantly positive in the self-first perspective condition, $t(41) = 8.95$, $p < .001$, Cohen's $d = 1.31$, the self-third perspective condition, $t(45) = 3.53$, $p < .001$, Cohen's $d = .52$, and the other-person condition, $t(39) = 3.71$ $p < .001$, Cohen's $d = .58$. In short, our findings suggest that imagining an event makes it implicitly true, but more so when one imagines him/herself from a first-person perspective.

4.2.3. Explicit and implicit truth

Unlike Experiment 1, the majority of participants in Experiment 2 rated the imagined event as true. We do not doubt that our participants could distinguish between imagination and reality.[6] Rather, in the context of the experiment, some participants might have understood the question about the truth of the imagined event as something else, perhaps because they also rated the truth of a non-imagined event. Yet about a third of our participants indicated the falsity of the imagined event, allowing us to examine whether the imagined scenario was implicitly true even when it was explicitly characterized as completely false. To this end we repeated the two-way ANOVA with perspective condition (self-first vs. self-third vs. other) and target card ("4 of diamonds" vs. "7 of spades") as independent variables on the subsample of 42 participants who rated the sentence about the selection of the target card as completely false. The analysis revealed that the D score was significantly different from zero even for those participants who rated the imagined event as completely false, $F(1,36) = 8.07$, $p < .01$, $\eta^2 = .18$. We found a marginally significant perspective effect, $F(2,36) = 3.14$, $p < .06$. Importantly, the self-first and the self-third comparison indicated a higher ITV in the former (.60 vs .20, $t(36) = 2.50$, $p < .02$, Cohen's $d = .41$). These results are noteworthy in light of the decreased power due to the shrinkage in sample size.

[6] In fact, the participants in Experiment 2 were asked during debriefing whether they had imagined or actually picked a card. None of the participants erred in answering this question.

4.3. Discussion

Experiment 2 used a continuous scale to assess ETV. Still, the analysis reveals that most of the participants viewed truth as a binary construct. That is, 83% of the participants used the most extreme scale values (i.e., completely true or completely false) to characterize the truth value of the imagined event. Thus, when people are queried directly about their perception of truth, most seem to treat it as a dichotomous construct: a proposition is either true or false. Such a conception of truth can lead to cases in which an entity will be rated as explicitly false yet give rise to implicit truth, demonstrating the usefulness of using implicit measures of truth. Moreover, people's conception of truth as a dichotomous construct cannot account for the differences between the ITV and ETV measures, because the perspective manipulation affected the two measures in different ways. Specifically, Experiment 2 shows that events that were imagined from a first-person perspective were implicitly truer than identical events imagined from a third-person perspective.

5. General discussion

In this paper, we advocate the usefulness of Implicit Truth Value (ITV) and contrast it with Explicit Truth Value (ETV). ITV relies on more spontaneous and less deliberate evaluations of truth. In our preliminary study, we used

the aIAT procedure to measure ITV and demonstrated that like real events, imagined experiences were implicitly truer than their non-experienced/non-imagined counterparts. In Experiments 1a and 1b, we showed that this effect occurred even when participants categorized the imagined event as false prior to the ITV assessment. In Experiment 2, we showed that events imagined from a first-person perspective were implicitly truer than events imagined from a third-person perspective, as measured by the aIAT, although the type of self-perspective had no influence on responses made on a true/false rating scale. Experiment 2 also indicated that imagining oneself performing an act increased the perception of truth associated with this act above the effects of familiarity with the imagined content.

5.1. Judgments of truth

Previous studies have extensively investigated the cognitive processes underlying explicit truth judgment and the factors that influence it. Johnson and colleagues (1981), 2006) proposed the source-monitoring framework to explain how people differentiate between memories of real and imaginary events. These authors suggested that when people assess the veridicality of their memories, they use heuristic processes that allow them to base their decisions on different qualities of mental experiences. For example, entities associated with meta-cognitive cues such as a high level of vividness and richness are more likely to be judged as real than those that are vague (see also Vrij & Mann, 2006). At the same time, considerations involving logic and reason (e.g., the plausibility of the event) influence judgments of truth. Johnson et al. (1993), among others, suggested that the heuristic processes influence explicit judgment when using systematic thinking is difficult. This conclusion also appears in studies on processing fluency (e.g., Hansen et al., 2008; Winkielman et al., 2003). The influence of fluency on explicit judgment of truth is found only in the absence of a contradictory systematic process. Accordingly, when one knows the capital of the United States is Washington DC, the sentence "New York is the capital of the United States" will not be rated as true regardless of the fluency of proposition.

Our studies differ dramatically from the above-mentioned studies because they show that despite *knowing* that an event is false, people may react to it as if it were true. Thus, in our experiments, systematic influence did not undermine the heuristic process. Specifically, even when the imaginary event was identified as imaginary, it gave rise to a pattern of response that was similar to that induced by the memory of an experienced event. In particular, it was easier for participants to respond when the same key was used to categorize the imagined-event sentences (rather than the non-imagined-event sentences) and true statements. This pattern reflects the ITV of the events. Our findings suggest the ITV need not correspond to people's beliefs about the truth of the entity they consider and may dissociate from ETV measured by self-reported evaluation. Our study focused on experimental settings that allow us to influence ITV in a different way than ETV. Our findings suggest the ITV and ETV are not the same, because they differ in their sensitivity to the different properties of the representation. Note that in spite of the difference in sensitivity, properties that influence ITV can also influence ETV (and vice versa) and therefore, the two truth evaluations co-vary in many cases.

The field of implicit attitudes has suggested the idea that people's explicit evaluations can differ from their spontaneous gut reactions (see Blair, Dasgupta, & Glaser, 2005; Nosek, 2007). Thus, for example, research has shown that people's *explicit* attitudes toward various minority groups are inconsistent with their attitudes, measured by the IAT or other implicit measures (Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002). A standard interpretation of this distinction is that explicit attitudes reflect only the content of the propositions that are endorsed by the respondent, whereas the implicit attitudes are sensitive to the content of all active associations, regardless of whether they are endorsed (Gawronski & Bodenhausen, 2006; Nosek, 2007; but see De Houwer & Moore, 2010). Using the ITV/ETV distinction, however, one might suggest that although people acknowledge explicitly that the negative attributes toward a stereotyped group are false, they still link them more readily to truth. Put differently, the stereotypical contents the stereotyping perceiver does not explicitly endorse might still be perceived as implicitly true for him or her. Accordingly, if this analysis is correct, implicit attitudes might be sensitive to the ITV, and the difference between the explicit and the implicit attitudes reflect the criteria used to evaluate truth: the explicit attitudes are based on explicit truth; the implicit attitudes are based on implicit truth.

5.2. Alternative explanations

Below we discuss three alternative interpretations of our findings.

5.2.1. Mere presentation

One might suggest that the mere presentation of the event (the selected card and its attributes) is sufficient to enhance the response in the compatible compared to the incompatible blocks. The findings in the other-person condition in Experiment 2 are consistent with such an interpretation, because we observed an enhanced ITV for the imagined event even if another person carried out the imagined action. Yet despite the fact that all the participants in Experiment 2 were exposed to the same description of the card, the ITV varied between the different imagination-perspective groups: imagination enhanced ITV significantly more for participants who imagined themselves picking a card than for participants who imagined another person picking a card, and the ITV of those who imagined the event from a first-person perspective was higher than that of participants who imagined the event from a third-person perspective. These results suggest that content and quality of imagination can influence perception of truth above the mere exposure to the content.

5.2.2. Salience asymmetry

One might suggest that both the imagined scenarios and true statements are more salient than non-imagined

scenarios and false sentences, and that the salience asymmetry drives the IAT effects (Rothermund & Wentura, 2004). According to this explanation, categorization is faster when true is paired with the imagined event and false with the unimagined event as a result of the similarity in salience and is not related to the specific categories. To explore this option, we compared the latency of categorization of true and false sentences in the first practice block (see Fig. 1) to test whether the sentences about the true events in our experiments were more salient than the sentences about the false events. Similarly, we compared reaction time for imagined and non-imagined sentences in the second and fourth practice blocks to test whether the sentences describing the imagined events triggered faster reactions than those pertaining to the non-imagined event. According to the salience-asymmetry interpretation, we should observe that (i) response time for true sentences is faster than response time for false sentences and (ii) response time for imagined sentences is faster than for non-imagined sentences. Using the data from the four experiments, a two-way mixed-model ANOVA with event (imagined vs. non-imagined) as a within-participant factor and experiment (preliminary study, 1a, 1b, and 2) as a between-participants factor revealed a significant effect for event $F(1,233) = 3.94$, $p < .05$, $\eta^2 = .0.17$. As anticipated under the salience-asymmetry interpretation, participants responded to sentences describing the imagined event faster than sentences describing the non-imagined event ($M = 877$ and $M = 913$, respectively). This effect of event did not interact with experiment, $F < 1$. We conducted a similar analysis to compare reaction time to sentences belonging to the true versus false categories. However, contrary to what might be expected under the salience-asymmetry interpretation, our results indicated a significant effect in the opposite direction; that is, participants responded significantly faster to sentences belonging to the false category than to the true category ($M = 1035$ and $M = 1091$, $F(1,233) = 4.71$, $p < .04$, $\eta^2 = .0.19$.). Moreover, for each participant, we created two indices based on the salience-asymmetry interpretation: truth-sentence salience ($RT_{false}–RT_{true}$) and imagined-sentence salience ($RT_{non\text{-}imagined}–RT_{imagined}$). The D score (which indicated the ITV effect) was not correlated with either the truth-salience index, $r(233) = -.030$, $p = .642$, or with the imagined-salience index, $r(233) = -.029$, $p = .658$. To conclude, the salience-asymmetry interpretation would suggest faster response time for target-related sentences than counter-target sentences and faster response time for true than for false sentences. Although response time was faster for target than for counter-target events, response time did not differ between true and false sentences. In addition, if salience asymmetry drove the effect of imagination on ITV, we would expect a positive correlation between faster response time for target and true sentences and the ITV effect. Our analysis does not support this pattern. Taken together, these findings rule out the salience-asymmetry interpretation.

5.2.3. Error in interpretation of truth

One might argue that ITV reflects an erroneous interpretation of truth in the context of the experimental setting. Two main findings support the erroneous-truth mechanism. First, as footnote 6 suggests, when the participants in Experiment 2 were asked during debriefing whether they had imagined or had actually picked a card, none of them erred in answering this question. This pattern differs dramatically from the pattern of responses in the explicit measure of truth observed in the experiment. Second, Experiment 1 reveals that in spite of our attempts to clarify that the imagined event was false, some participants classified it as true. These findings are consistent with the suggestion that some participants interpreted the term "true" in the explicit self-report measure as "seen it before," "thought about it in the context of the experiment," or "imagined it as true as possible." Moreover, the specifics of the protocol of guided imagination, namely, asking participants to generate a vivid imagery and contrasting it with an equivalent event that was not imagined, might have influenced the tendency to erroneously respond "true." However, the erroneous-truth mechanism implies the ETV and ITV measures would show similar patterns of responding. This is not what we find. Our results indicate two significant dissimilarities between the response patterns associated with the two measures. First, the findings suggest that imagination induced enhanced ITV even for participants who did not confuse imagination with experience, that is, those who rated the imagined event "false." Second, the ITV and ETV measures of truth were uncorrelated. Accordingly, our findings demonstrate the added contribution of the quality of imagination to the strengthening of the ITV.

5.3. Measuring ITV and ETV

In the current research, we define Implicit Truth Value as spontaneous truth evaluation. We base this conceptualization on terminology used primarily in the attitude domain, suggesting that implicit evaluations reflect instances in which stimuli automatically and spontaneously influence evaluative response (e.g., De Houwer et al., 2009; De Houwer, Gawronski, Barnes-Holmes, 2013). Our study suggests that implicit measures of truth differ from explicit measures in their sensitivity to non-content features of the (imagined) representation, thereby demonstrating their usefulness for theory and research.

We used the aIAT as a means to measure the implicit evaluation of truth. In this task, the evaluation is implicit in the sense that participants are not required to verify or falsify the statements describing the autobiographical events, and the truth value is inferred by comparing performance between the compatible and incompatible blocks. In addition, the speeded nature of the task reduces strategic thinking. Our findings demonstrate that the aIAT is efficient in measuring variation in the characteristics of mental representations. However, the aIAT shares some of the limitations of the traditional IAT, such as its reliance on relative rather than absolute evaluation (see Blanton & Jaccard, 2006). Thus, for example, in the current research, the D scores do not reflect the absolute truth value of the imagined event, but rather the relative (implicit) truth value compared to a non-imagined event. To address this issue and to gain a better understanding of ITV, future

research could use measures other than the aIAT. Some implicit measures such as the Sheffield lie test (Spence et al., 2001; Verschuere, Spruyt, Meijer, & Otgaar, 2011), which is based on the traditional Stroop effect (Stroop, 1935), have already been adapted for truth evaluations, and other tasks such as evaluative priming (Fazio, Sanbonmatsu, Powell, & Kardes, 1986) or the Implicit Relational Assessment Procedure (IRAP; Barnes-Holmes et al., 2006) can be easily adapted.

5.4. Implications

The use of ITV as a theoretical construct can help in deriving predictions about psychological phenomena based on the distinction between truth and falsehood. The most relevant phenomenon is lying. Our research suggests that lying about content that is represented in the mind might be easier than lying about more pallid content, because imagined content might feel truer even when the deceiver knows he or she is lying. Thus, making a claim that is false but represented in the mind will be less threatening to the deceiver's self-concept as an honest person. In line with this suggestion, Shalvi, Dana, Handgraaf, and De Dreu (2011) recently showed that people are more likely to deceive using experiences they have encountered in the past than using novel experiences.

Just as people can increase the ITV of their lies by drawing on imaginary representations, our findings imply individuals can deceive *themselves* by creating a desirable representation. For example, people may purchase "skinny mirrors" that make them appear thinner to boost their self-confidence. Although they know about the mirror's bias, they still prefer the desirable reflection. We think that merely having a representation of the desirable outcome makes it feel implicitly truer.

Many real-life manipulations create vivid images of unreal events or objects, such as listening to stories, reading books, and watching movies. In such cases, events or actions that are known to be false generate a real emotional response (Holmes & Mathews, 2005). This phenomenon, which the philosophical literature refers to as *the paradox of fiction* (Radford, 1977), can be understood within the framework of the present research. We speculate that ITV determines the extent to which the fictional scenario will have an emotional or behavioral effect. This suggestion is consistent with findings showing that an intervention that interferes with sensory perceptual information processing or reduces the vividness of disturbing memory representations weakens their influence (Deeprose, Zhang, Dejong, Dalgleish, & Holmes, 2012; Engelhard, van den Hout, Janssen, & van der Beek, 2010).

At the most general level, our theoretical analysis reinforces what we know about the complexity of the human mind. Information is processed simultaneously at different levels using different processes. Unsurprisingly, therefore, perceivers who cognize (explicitly) that a specific piece of information is false might still be influenced by it as if it were true. Conversely, people who acknowledge something as true might be unable to accept it as such and react to it as if it were false. Accordingly, the distinction between the explicit (ETV) and the implicit (ITV) senses of truth might help us understand a wide array of phenomena in which people behave as if they are inconsistent or irrational.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.cognition.2014.08.005.

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